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# The Analyst,

INCLUDING THE PROCEEDINGS OF

THE "SOCIETY OF PUBLIC ANALYSTS."

MONTHLY JOURNAL FOR THE INFORMATION OF THOSE INTERESTED  
IN THE PURITY OF FOOD AND DRUGS, AND IN GENERAL  
ANALYTICAL AND MICROSCOPICAL RESEARCH.

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EDITED BY

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ONE OF THE

*Hon. Secretaries of the Society of Public Analysts:*

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*President of the Society of Public Analysts.*

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# THE ANALYST.

JANUARY, 1879.

WITH this number we issue to Subscribers and to Members of the Society of Public Analysts the Index and Title Page to our third volume. Non-Subscribers can obtain them by ordering through their Booksellers at 3d. per copy.

Our readers will please take notice that, to meet the demands of our increased circulation, we have changed our publishing arrangements, and "THE ANALYST" the fourth volume of which commences with this number, will in future be published by Messrs. Baillière, Tindall & Cox, 20, King William Street, Strand, to whom all business communications are to be addressed. Letters for the Editors are also to be forwarded to that address.

We shall endeavour this year, as we have done previously, to make "THE ANALYST" more valuable as a purely technical Journal to the numerous and increasing body of practising Analysts in this country, and shall be glad to receive original papers or reports from any chemists who may be willing to become contributors.

## THE SOCIETY OF PUBLIC ANALYSTS.\*

THE Annual Meeting of this Society will be held at Burlington House, on Wednesday, the 15th January, when the Officers and Council for 1879 will be elected. The Annual Dinner will afterwards take place, particulars of which will be duly announced by circular to the Members.

## ON THE DETECTION AND ESTIMATION OF ALUM IN WHEAT FLOUR.

BY A. DUPRE, Ph.D., F.R.S.

*Read before the Society of Public Analysts on 20th November, 1878.*

At our June meeting I stated that I was engaged in the examination of a number of samples of flour, with a view of discovering the relation existing between the amounts of silica and alumina present in pure wheat flour, or, at least, in such flour in which the only extraneous alumina and silica present are derived from the soil adhering to the grain.\* It is obvious that if, in unadulterated samples of flour, anything like a regular relation exists between these two constituents, a knowledge of such relation would enable us at once to discover the addition of any appreciable proportion of alum to any given sample of flour. No doubt many analyses will be necessary to fix this relation with a sufficient degree of accuracy, and the analyses given below must only be looked upon as a small contribution towards this end.

Table I. gives the result of the analyses of twelve samples of flour, ranged in order according to the amount of silica they contained. Eleven of these samples were bought at respectable shops in London (partly bakers, partly cornchaudlers), and one from a

\* *Analyst*, vol. 3, p. 283.

baker at Chelmsford. In none of the samples could any alum be detected. The numbers in the table represent grains in 4-lbs. of flour.

No. of the Flour.	Silica.	Alumina.	Oxide of Iron.	Alum corresponding to total Alumina.
1	3.08	0.63	0.42	5.58
2	3.42	1.26	0.35	11.16
3	4.93	1.80	0.95	16.94
4	5.64	1.41	0.67	12.49
5	7.28	2.30	1.79	20.37
6	8.17	1.07	0.42	9.48
7	8.85	1.62	0.67	14.35
8	10.36	2.79	1.63	24.72
9	13.80	2.79	0.48	24.72
10	15.57	2.50	1.67	22.15
11	15.79	2.05	1.07	18.16
12	26.91	3.72	1.63	33.06

A glance at this table will show that although there is, in general, an increase in the amount of alumina corresponding roughly with the increasing proportion of silica, yet that such increase is by no means regular; it is therefore obvious that no uniform relation between these two constituents exists, but, nevertheless, a relation sufficiently close for practical purposes may, I believe, be made out. To arrive at this I have divided the flours into three classes. The first class consists of flour containing from 0 to 5 grains of silica in the 4-lbs.; those of the second class contain from 5 to 15; and lastly, those of the third class from 15 to 30 grains silica in the 4-lb. If, in flour of the first class, we multiply the silica by 2.86, we get, approximately, the number of grains of alum corresponding to the amount of alumina naturally present in the flour, or derived from the soil adhering to the grain. In those of the second class this multiplier is 1.90, while in those of the third class it is 1.26.\* Table II, gives the amounts of alum thus calculated from the silica as compared with the alum corresponding to the alumina actually found. If the amount of alum thus calculated falls materially short of the amount of alum corresponding to the proportion of alumina found, the presumption would be that alum had been added to the flour.

No. of Flour.	Alum calculated from the Alumina.	Alum calculated from the Silica.	Difference between columns 3 & 2.
1	5.58	8.81	+ 3.23
2	11.16	9.78	- 1.38
3	15.94	14.10	- 1.84
4	12.42	10.52	- 1.90
5	20.37	13.83	- 6.54
6	9.48	15.52	+ 6.04
7	14.35	16.81	+ 2.46
8	24.72	19.68	- 5.04
9	24.72	26.22	+ 1.50
10	22.15	19.62	- 2.53
11	18.16	19.89	+ 1.73
12	33.06	33.91	+ 0.85

\* In the case of flours with but little silica and alumina, the alumina naturally contained in the flour is probably a considerable proportion of the total quantity found, the rest being derived from the soil. As more and more soil gets mixed with the flour the alumina derived from such soil more and more preponderates. In the first case there is not many times more silica than alumina, in the latter the silica very greatly exceeds the alumina, the relation between these two more and more approaching that found in soils.

The numbers in the table do not by any means agree as closely as might be wished, still, the maximum difference between the number of grains of alum in the 4-lbs. of flour, as calculated from the alumina and silica respectively, amounts to only a little over 6 grains, and this difference is found both positive and negative. It follows that about 12 grains of alum might have been added to 4 lbs. of No. 6 flour, the one extreme, to bring it to the other extreme, No. 5, and this amount of alum, when added to No. 6 flour, could not be detected by the means here proposed. But 12 grains of alum in 4-lbs. of flour correspond to only about 8 grains in the quartern loaf, and this quantity, which is the maximum which could be added under the most favourable conditions without detection, may, I think, be fairly neglected, at least as far as any adulteration injurious to health is concerned. When the amount of silica present is less than 5 grains in 4-lbs. of flour, the proportion of alum which could be added without detection is only about 3 grains to the quartern loaf. I hope some, at least, of our members will take this subject up, and give us their results, taking care always to deal with pure wheat flour only. We should then soon be in a position to correct the numbers given above for multiplying the silica, and thereby most probably increase the accuracy of our results. I have, as will be seen, left the oxide of iron out of consideration for the present, but a more extended experience may enable us to make use of this factor as well. Thus, Nos. 5 and 8, which give the greatest divergence, in one direction, between the two methods of calculation, contain a very high proportion of oxide of iron, relative to the silica, as compared to the other samples. One other point of interest may be mentioned. Nos. 1, 2, 4, 5, 6, 7, and 9, were sold as best flour: Nos. 3, 8, 10, 11, and 12, as seconds; or almost all the best flours are characterised by a low, almost all the seconds by a high proportion of silica. Nos. 9 and 12 were bought at one shop (a corn chandler's), the lower quality having considerably more silica than the higher, and although both these have the highest proportion of silica in their respective classes, still the apparent relation between price and silica holds good.

The method just described, though applicable to flour, will, I believe, be found useful chiefly for the estimation of alum in bread. In the case of bread, it will indeed be, in conjunction with the logwood test, the only tolerably trustworthy process at present available. For the detection and estimation of alum in flour, the following method will, however, be found preferable.

If, as described in my note of June 26th, 100 grams, or less, if much alum be present, of flour are well shaken up with from 300 to 500 cub. cent. of chloroform,\* (best in a closed conical separating funnel), and the mixture is then allowed to stand at rest, the flour will rise to the surface, while the mineral impurities will sink to the bottom and can readily be drawn off, together with some chloroform, by means of the lower tap. Most of the alum contained in the flour will be found in this deposit. Small pieces—such, for example, as would just pass through a wire sieve with twenty-four meshes to the linear inch—are deposited in a few minutes, and may readily be extracted, while much smaller pieces could, I have no doubt, be readily seen with the aid of a lens or microscope. In order, however, to test for alum in the deposit, if it cannot be thus mechanically separated, the following plan may be adopted. The deposit is filtered off from the chloroform drawn with it from the funnel, and, when dry, is thoroughly exhausted on the filter with cold

\* I have used the ordinary methylated chloroform in my experiments, redistilling from a water bath after use, and simply separated it from the water carried over with it by letting it stand for some time.

water. In this aqueous solution, which will be found distinctly acid even if not more than 10 grains of alum were present in 4-lbs. of flour, sulphuric acid and ammonia (the latter, of course, only if ammonia alum had been used) can be readily detected, but there is generally but little and sometimes no alumina. More or less of the alumina always remains in the residue insoluble in water, probably absorbed by the flour, of which some is always present in the deposit. The alumina is therefore best tested for in a separate portion of deposit, which, for this purpose, is boiled in very dilute hydrochloric acid, which does not act on the soil or clay, and the clear filtrate is tested for the alumina. If the deposit at first obtained is once more shaken up with a little fresh chloroform, a further separation of the alum from the flour, of which a little is always carried down with the mineral matter, may be effected; but this additional trouble is not, I think, necessary.

If the flour is only to be tested qualitatively nothing further is necessary, but if we wish to estimate the amount of alum that may be present somewhat more trouble must be taken. When, after the first thorough and violent shaking up, the lower portion of the chloroform has become clarified, the contents of the funnel are again agitated, but in such a manner as not to disturb the sediment already formed. This shaking up is repeated frequently (a dozen times or so) in the course of a day, and the mixture is then left standing over night. The following morning the deposit formed is drawn off, and the shaking up, &c., &c., repeated during the course of the second day. After a final night's rest, the small amount of deposit which will generally be found is also drawn off and added to the first portion. The deposit, after the chloroform has evaporated, is then extracted, on the filter, and the solution made up to a given bulk, say 50 cub. cent. In from  $\frac{1}{20}$  to  $\frac{1}{10}$  of this the ammonia may be estimated by Nesslerising, and in the remainder the sulphuric acid is determined as sulphate of barium with the usual precautions, boiling the precipitate first obtained with hydrochloric acid, &c. From the sulphuric acid thus found the alum is calculated either as ammonia or potash alum, as the case may be.†

The separation of the alum from the flour by these means is much more complete than one would at first sight imagine. Thus, three mixtures were made, containing respectively 28 grains, 10 grains, and 2 grains of very finely powdered and sifted ammonia alum to 4-lbs. of flour. Portions of 100 grams of each of these flours were treated with chloroform, as above described, for two days, and the sulphuric acid estimated in the cold aqueous extract of the deposits obtained. The results are given in Table III.

TABLE III,

	Amount of Flour taken.	Amount of barium sulphate obtained.	Ammonia alum corresponding to this calculated on 4-lbs.	Ammonia alum actually contained in 4-lbs. Flour.
1st Mixture ...	100 grams. ...	0.0997 grams. ...	27.10 grams. ...	28 grams.
2nd ,, ...	100 ,, ...	0.0302 ,, ...	8.21 ,, ...	10 ,,
3rd ,, ...	100 ,, ...	0.0042 ,, ...	1.14 ,, ...	2 ,,

† If any sulphate of calcium is found in the flour it is necessary to estimate the calcium contained in the aqueous extract of the deposit and to subtract the amount of sulphuric acid with which this is combined from the total amount of sulphuric acid found, and the remainder only is calculated as alum. The presence of any other soluble sulphate must of course also be taken into account.

In the last case the ammonia was also estimated, and amounted to 0.00015 grams in the total aqueous solution, corresponding to 1.004 grains ammonia alum in 4-lbs. of flour.

The pure flour, used in the above experiments, treated in the same way with chloroform, yielded, when 100 grams of flour were taken, a deposit the aqueous extract of which was neutral, yielded no trace of precipitate with barium chloride, and was almost absolutely free from ammonia.

The insoluble residue on the filter may be submitted to the logwood test with great advantage, but only under certain precautions. On applying the test to the insoluble residue of the deposit obtained from pure flour, a strong bluish tint was produced, very much as if alum had been present. Further examination showed that pure moist clay gave a very decided bluish-grey tint with the logwood test, and as the insoluble part of the deposit from flour contains all the soil and clay from such flour, the test as thus used is misleading. The tint produced in clay is, however, darker and less blue than that produced with flour containing alum, and when the mixture is allowed to dry the blue colour disappears almost entirely, being replaced by a pale grey tint with a shade of red in it, whereas the tint produced with flour and alum retains its bluish colour. If, then, we allow the deposit to which we have applied the logwood test to dry up, by exposure to the air over night for example, it will not show any blue colour if the flour from which it was obtained contained no alum, but will be more or less distinctly blue if any alum was present. Even if no more than 2 grains of alum were contained in 4-lbs. of flour, the deposit obtained, as above, from 100 grains of flour will yield a distinctly blue colour, which remains on drying. I have not gone below the proportion of 2 grains of alum per 4-lbs. of flour, but I have no doubt that even smaller quantities might be detected with certainty by the means here described.

Chloroform has, as stated at the end of my former note on this subject, been previously employed for the detection of mineral matters, such as the sulphates of barium or calcium, carbonate of calcium, &c. in flour<sup>†</sup>, but only when present in comparatively large quantities, and the amount of flour recommended to be taken would have been insufficient for the detection of alum in the small proportion in which it is usually added. I first employed chloroform with the idea of dissolving out the alum by means of a solvent having little or no action on the flour itself. Various liquids were tried and among them chloroform, as, in consequence of a mistake, I had been led to believe that chloroform dissolved an appreciable proportion of alum. It was only after vainly trying to extract the alum from some flour to which I had added it that I found it to be practically insoluble in chloroform, but that, in consequence of its greater specific gravity, it could readily be detected in the deposit yielded when flour and chloroform are shaken up together and are then allowed to stand at rest.

In conclusion, I may remark that, as far as my present experience goes, no flour need be examined for alum if when examined by the logwood test it yields no indication of its presence. Should, however, alum be indicated by this test the flour must be submitted to other tests, in order not only to confirm the presence of alum but also to estimate its amount.

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<sup>†</sup> C. Himley, Wagner's Jahresbericht, 1876, p. 699.



## NOTE ON THE DETECTION OF ALUM IN FLOUR BY THE LOGWOOD TEST.

By W. C. YOUNG, F.C.S.

*Read before the Society of Public Analysts, on 26th June, 1878.*

It must be admitted that a distinctive test, such as the logwood, would possess great value if the reaction given by it could be strictly assured in all cases where alum is present.

At the present time, however, very few chemists have any faith in it as a test for alum in flour, so often have they failed in obtaining any indication of its presence even when it has been purposely added.

With bread the case is different, as I have never failed to get the desired reaction when trying it upon samples to which alum has been added in the process of manufacture.

At first sight it is difficult to see why the reaction is not obtained with alumnised flour; in the case of bread one would expect some interference by reason of the decomposition of the alum which undoubtedly takes place in the baking, but in flour the alum must remain unaltered.

Various reasons have been given to account for this difficulty, of which I may mention, the use of old logwood chips (or such as had been exposed to the air) for making the tincture; and the use of a wrong proportion of carbonate of ammonium solution to tincture of logwood.

I have had recently several samples of flour, which, upon analysis gave quantities of phosphate of alumina equal to alum, varying from 15 to 25 grains in 4-lbs., and as I could not in any of them obtain an indication by the logwood test, I felt I could not safely, in the face of what has recently occurred at Selby, certify that it was present; at the same time I confess that if that case had terminated differently I should have done so. In connection with the examination of these samples I mixed alum with flour in progressive quantities, and, except in a few cases, failed to get the reaction, and in these few the colour was in patches in the under portion of the mass, the surface colour being the dirty brown usually given after standing a time when alum is absent, so that it may well have been passed as pure. I then applied the test to powdered alum and found that the colour came very slowly, and where a considerable amount of carbonate of ammonium had been used, the deep claret colour had changed to brown in the upper part of the liquid, before anything like the blue appeared in the lower.

This result clearly indicated a solution of the difficulty, as it showed that it was necessary to have the alum dissolved in water before applying the test, and upon mixing the flour to a thin paste with boiling water previous to adding the ammoniacal logwood tincture, a blueish grey colour is developed in a few minutes, which is unmistakeable with so small a quantity as 5 grains of alum to 4-lbs. of flour; the colour stands well for seven days, whereas the ordinary colour obtained without alum will not last as many hours.

Treated in this way the test answers well, no matter what age the logwood tincture may be, or what the character of the chips from which it is made, always provided that the deep claret colour is produced in it on the addition of solution of carbonate of ammonium.

It appears to me very probable that the varying results I have hitherto obtained may be due to the circumstance of my having added more at one time than another of

carbonate of ammonia, thus rendering the solution of the alum in some cases more easy than in others.

How far these few facts affect the value of the decision of the Inland Revenue chemists in the "Selby" flour case, of course I am unable to say, but should it appear that they applied the test before having made sure that the alum was dissolved, I make bold to assert that they would have obtained no indication even had there been twice as much alum present as was certified by Mr. Allen.

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### ON THE LOGWOOD TEST FOR ALUM.

By W. W. STODDART, F.I.C., &c.

IN the year 1858 Mr. Hadow, when demonstrator of chemistry in King's College proposed as a test for the presence of alum in bread the decoction of logwood, with the mode of preparation and method of applying it, as an easy and effectual test. He affirmed that he could, without difficulty, detect 5·7 grains of alum in each pound of bread. About three or four years afterwards Mr. Horsley, of Cheltenham, published a peculiar method of application, so that a much smaller quantity of alum may be made evident. With or without alum the bread is coloured a strong and distinct purple colour, but when the bread is afterwards exposed on a porcelain capsule to the atmosphere for a few hours, if alum is absent the beautiful colour disappears, and a dull *brown* takes its place, but if alum has been mixed with the bread a conspicuous and beautiful blue is the permanent result. I have, for some years, been in the habit of employing the logwood test, in the manner recommended by Mr. Horsley, invariably with a successful and reliable result, so much so that I was astonished at hearing and reading that several analysts had found the test useless. Dr. Hassall, in the last edition of "Food and its Adulterations," says, "The logwood test is fallacious. We have frequently employed this test in cases in which alum has been present without obtaining the slightest violet coloration."

So invariably have I found the reverse happen that I have often wondered why so many good chemists have failed.

I think the cause of disappointment is in the logwood itself. The wood must be freshly cut and kept in a stoppered bottle, secure from the atmosphere. The decoction or alcoholic tincture also must be recently prepared. If this precaution be not strictly observed, the logwood test is quite useless. I have frequently found that, where the tincture has been made for some months, that even strong ammonia or solution of potass has not had any effect in altering the colour of the logwood solution. The fact is that the usefulness of this test is altogether dependent on the presence of hæmateate of ammonia, which is instantly formed when ammonia is added to hæmatoxylin.

If a few crystals of fresh hæmatoxylin be used instead of the wood itself, the same reaction is produced. The solution on exposure to air changes to a *brown*, but if a trace of alum be present, a beautiful and striking *blue* is left instead.

My experience has been so invariable and distinctive, that if this singular reaction is wanting I do not proceed further in the analysis.

Of course I need not say, I always perform the chemical separation of alumina and sulphuric acid before evidence of adulteration is shewn in a court of justice, although I really think the logwood test, if properly made, is quite decisive.

## ON THE NITROGENOUS CONSTITUENTS OF COCOA.

By G. W. WIGNER, F.C.S.,

*Read before the Society of Public Analysts, on 20th November, 1878.*

Cocoa has been constantly referred to as one of the most nutritious foods, because of the high proportion of nitrogenous matter contained in it. Payen in the analysis of nibs, free from husk, found 21·2 per cent. of albuminous matters, and Church in the recent guide to the Bethnal Green Food Collection, gives 17 per cent. of albuminous matters, as the average of pure roasted cocoa nibs. Heisch examined a number of samples of roasted cocoa beans obtained from different localities, the results of which were published in *The Analyst*;\* but in most cases, he found figures considerably lower than these; the highest amount yielded by his samples was 2·06 of nitrogen, corresponding to 13·03 per cent. of albuminous matters, and the lowest was 1·17 per cent. of nitrogen, corresponding to 7·40 per cent. of albuminous matters. All these determinations appear to have been made by the estimation of nitrogen by the soda lime process, and the calculation of the albuminoids from the total nitrogen found.

The recent investigations of Church and others on the form in which the nitrogenous matters exist in roots and cereals, and my own recently published investigations on the nitrogen compounds present in the cereals, led me to think, that the nutritive quality of cocoa might possibly have been somewhat over estimated, owing to the non-separation of the coagulable from the non-coagulable albuminoids. This process gives us two determinations, one of the total nitrogen, and one of the coagulable nitrogen, both subject, of course, to the errors due to the soda lime process. The latter determination, viz., coagulable nitrogen, is the only one, which in the present state of our knowledge, we are justified in assuming as really flesh forming matter, since it is this only which can be classed as true albuminoid matter. The non-coagulable nitrogen may, and part of it unquestionably does exist in the forms of nitrates and nitrites, and another part exists in the form of alkaloids, and at present, we have nothing to prove that either of these are properly classed as flesh formers.

If therefore, this proportion of non-coagulable nitrogen is found to be high in any food, it follows, that we must consider its nutritive value as being so much lower than had been hitherto supposed when the calculation was made from the total nitrogen.

Now in the cases of wheat, barley and oats, I find that various proportions, sometimes as much as 35 per cent. of the total nitrogen, are in non-coagulable forms, and on extending this enquiry to cocoa, I find that the percentage of the total nitrogen so present is in many cases higher than even these figures.

I have, of course, been able to examine only a limited number of samples, and therefore, I have selected six ordinary commercial samples, and four samples of entire cocoa beans. The commercial samples are practically certain to be admixtures of different varieties of cocoa, and therefore, in a case like this they will give a more correct general impression than selected samples of special varieties. It is true that most of the commercial samples contain an admixture of either starch or flour, but by bearing in mind that average flour contains about 90 per cent. of its nitrogen in a coagulable form, it is easy to make the allowance for this admixture.

I am indebted to Mr. Heisch for the four samples of roasted beans. The determinations in these cases have been made on the entire bean, the husk not being removed.

The following are the results obtained:—

NITROGENOUS MATTERS IN ORIGINAL SAMPLES.

Mark.	Total N.	Coagulable N.	Total albuminoids = N × 6.33	Coagulable albuminoids = N × 6.33	Difference = Non-coagulable nitrogenous matter.	per cent. Total N. coagulable.
A	1.095	.600	6.92	3.80	3.12	54.9
B	1.162	.760	7.35	4.81	2.54	65.5
C	2.978	2.335	18.84	14.79	4.05	78.5
D	.965	.375	6.11	2.37	3.74	38.8
E	.699	.330	4.42	2.09	2.33	47.3
F	1.201	.770	7.61	4.88	2.73	64.1
Socunza	2.040	1.175	12.92	7.44	4.48	57.6
Para	2.000	1.045	12.67	6.62	6.05	52.2
Trinidad	1.490	1.050	9.46	6.65	2.81	70.3
Grenada	2.370	1.335	14.99	7.56	7.43	50.4

It thus appears, that even in the very best of the samples, 21.5 per cent. of the nitrogenous matter present is in a non-coagulable form, and cannot, therefore, in the present state of our knowledge be recognized as of value as a flesh former. While in the case of the prepared cocoas, the proportion present as true gluten falls in one case to 39 per cent. of the total quantity, and in the case of one of the entire cocoa beans to about half of the total found by the ordinary combustion. The average of the entire beans being 57.6 per cent. of the nitrogen in the coagulable form.

Until the nutritive value of non-coagulable albuminoids is proved, cocoa must therefore rank far lower in the scale of foods than it has done hitherto.

ON A FERMENT PRODUCED BY THE MORBID GROWTH OF THE  
BIOPLASM OF THE YOLK OF EGG.

By WILLIAM THOMSON, F.R.S.E.

I HAVE read with interest the two cases of mysterious poisoning—the one described by Mr. A. H. Allen, the other by Dr. Muter—in the November issue of your valuable journal, and each recalls to my mind a peculiar ferment studied by the late Dr. F. Grace-Calvert and myself some years ago. It was a cell which propagated itself in the same manner as yeast, and when it developed in large quantity in any fluid it emitted such a fulsome, putrid odour, that we termed it the “putrid cell.” We traced the origin of this cell in egg albumen solutions to the yolk of the egg, and it appeared to us that it was a morbid growth of the bioplasts of the yolk, which, had they followed their normal course of development, would have gone to form the bone, flesh, tissues, etc., of the chicken.

Our attention was first drawn to this ferment by observing that when eggs were left under certain conditions, some putrified, and when the contents of the rotten eggs were microscopically examined, none of the generally recognised putrifactive ferments, such as bacteria, nor any fungoid growths, could be observed, but the contents were full of cells of very different sizes, but of the same conformation. When this decomposition had gone far we found the yolk entirely disintegrated and mixed up completely with the white; but when the growth had not gone so far we found that the yolk had swelled out more or less and the white had become milky from the presence of “putrid cells” in it. The yolk generally swelled to about twice its original size before bursting. On microscopical examination of one of these swelled yolks, in comparison with a healthy

one, we saw that the minute granules, which resembled minute dots, and which constituted the healthy yolk, had each swelled out in the abnormal yolk and appeared there as distinct cells of different sizes.

As an example of the conditions under which this growth will take place I may mention a series of experiments in which a number of eggs were well coated with shellac and left for about eighteen months. After that time the coating was still perfect, and some, on being broken, were found to be perfectly fresh and good, but on striking the shell of one with the point of my knife it burst from the pressure of gas inside, scattering the contents in all directions. The contents had evidently lost no moisture by evaporation, and the yolk was entirely disintegrated and thoroughly mixed up with the white, and the whole emitted a disgusting putrid smell. The microscope revealed the presence of our old friend the "putrid cell" as being the sole cause of this decomposition. These cells are, we believe, not entirely confined to the yolk of egg and egg albumen, because we have observed cells of precisely the same appearance in other fluids, such, for instance, as in water in which putrid meat had been washed. I now come to the question of the physiological effects of these cells, or of the products produced by their growth; only one experiment was made on this point, and I therefore do not give the result as by any means conclusive. A healthy dog was put under chloroform, a small triangular flap of skin dissected away, a blood vessel exposed, and about 20 grains measure of an albumen solution swarming with bacteria, injected into its blood by means of a morphia syringe, and the small wound dressed. The dog was all right about half-an-hour afterwards and remained in excellent spirit and health during about the next two months: at the end of that time we desired to observe the physiological effects of an animalcule, which we obtained by washing the outside of the shell of an egg with a solution of albumen. It resembled a corkscrew, its body remaining almost perfectly rigid, and its length was from  $1\frac{1}{2}$  to 2 turns of the screw, and it propelled itself by turning rapidly round, and thus went through the fluid on the same principle as a corkscrew goes through a cork. About 20 grains of a fluid swarming with this kind of animalcule was injected into the blood of the dog by the same process as above described, this had no injurious effect upon it and it continued to live a long time afterwards in as good health as before. We then decided to try a third experiment on the physiological action of the "putrid cell." Part of the contents of an egg which had been thoroughly disintegrated by this morbid growth was diffused through a little albumen solution and 20 grains of it injected as before into the blood of the dog, but almost immediately afterwards the dog had a slight convulsion and died. It is possible that this was due to the poisonous action of the "putrid cell" or products produced by it, but as the experiment was not again repeated I am not prepared to say that the chloroform had nothing to do with its death, and unfortunately it will now be illegal for me to repeat the experiment. The experiment is, however, given for what it is worth.

In conclusion, I would simply ask, first, whether this ferment has not been the cause of the foul odour and poisonous effects of the sample of milk, described by Dr. Muter, and produced under special conditions either directly from the milk itself or from some foreign organized granules or cells in it?—and, secondly, whether the eggs in the bread pudding might not have been the direct cause of this ferment, and the ferment the cause of the poisonous effects which the bread pudding produced, and which were so well described by Mr. A. H. Allen.

## AMOUNT OF SOLIDS IN MILK.

By CHARLES A. CAMERON, M.D.

As a contribution towards a solution of the question as to the minimum amount of solids in milk, the following may be of some assistance:—

About two years ago a somewhat large number of specimens of milk were sent to me for analysis by the Corporation of Drogheda. Very few of them were of fair quality, some were of very doubtful composition, others were partly skimmed or were watered. Several of the vendors of the skimmed and watered milks were prosecuted and fined. A second batch of samples of milk was subsequently sent up, and exhibited a marked improvement—only one specimen was largely adulterated, and its vendor was prosecuted and fined. The result is that the milk sold in Drogheda during the present year appears to be perfectly free from adulteration. I shall not give full details of analyses but merely the total solids in each of the specimens sent from time to time in 1878. Percentage of solids:—13·49, 13·60, 13·90, 12·55, 13·70, 12·75, 13·52, 13·10, 13·00, 13·15, 12·30, 12·98, 12·19, 12·75, 12·36, 12·89, 12·25, 14·79, 13·84, 14·55, 14·48, 13·89, 12·80, 12·82, 12·80, 13·00. Average of the 26 specimens, 13·31. These 26 samples of milk were taken partly from the supplies brought into town by the country people and disposed of to the local dealers, partly from the milk of the local cowkeepers. The samples were taken without any previous warning, the inspector of food being put into motion by the borough surveyor. We may take it for certain then that the milk of the dairy cows in the neighbourhood of Drogheda contains on the average more than 13 per cent. of solids. The minimum amount in the 26 samples was 12·19, the maximum 14·79. More than one half contained over 13 per cent. of solids. Ten grammes of each sample were evaporated to dryness in a shallow capsule, and care taken to ensure thorough dessication.

## REVIEWS.

## BAYLEY'S CHEMIST'S POCKET BOOK.\*

We have rarely seen a more useful book than this. It contains a large amount of information useful not only to chemists but to chemical manufacturers of all kinds, and it is a handy book for students. It contains very complete tables on the various matters, including a valuable abstract of the co-efficient tables from Fresenius, for the calculation of the weights of substances sought from those found, comprehensive tables for the conversion of weights, tables as full as any we have recently seen, of the boiling points, specific gravity, vapour densities and solubilities of a large number of compounds, a useful abstract of the dictionary of solubilities—more valuable perhaps than it would otherwise have been, because of the difficulty of procuring copies of Storer's work on the subject, and a fairly comprehensive scheme of qualitative analysis comprised in a really small space, and yet intelligible. We cannot do better than recommend our readers to procure the book for themselves, feeling sure they will not regret their purchase. It might have been better had the book been in the form of an ordinary volume, instead of in its present form, as it would have been more handy, but that does not affect the value of the contents, of which we think highly.

### THE HOUSE SURGEON OR THE DOCTOR AT HOME.

THIS is a little work written by the late Alfred Smee, and issued by the Accident Insurance Company. It makes no pretensions to give full details of treatment, but only just sufficient information to enable any person, with ordinary sense and a few simple appliances at hand, to treat most of the common and some of the uncommon accidents in a sensible and efficient way until medical help can be procured. To say the least it is a useful book, the study of which may often save a great deal of after suffering from accident.

### CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

TO THE EDITOR OF "THE ANALYST."

SIR,—I enclose a newspaper account of an interesting milk case which has just been dismissed on the "non-prejudice of purchaser" ground.

You will note the ingenious character of the adulteration. The milk was simply diluted by an addition of 20 per cent. of a solution of cane sugar in water, having the same specific gravity as ordinary milk, or nearly so; the consequence was that the total solids were 12·37 per cent., while the ash was only ·57. The fat amounted to 3 per cent.; the solids not fat therefore 9·37. This made up—

Caseine, &c.	...	...	...	...	...	...	...	...	...	2·9
Milk Sugar	...	...	..	...	...	...	...	...	...	2·8
Cane Sugar	...	...	...	...	...	...	...	...	...	3·1
Ash	...	...	..	...	...	...	...	...	...	·57
										9·37

The whey of a milk sophisticated in this way may, of course, be very easily tested for cane sugar by dividing a measured quantity into two parts, inverting the sugar in one half by  $H^2SO_4$ , and titrating both with Fehling.

December, 1878.

TRURO.

Yours truly,

J. H. COLLINS,

*Public Analyst for the County of Cornwall,  
the City of Truro, and the Boroughs of  
Penzance and Launceston.*

### LAW REPORTS.

BATH POLICE COURT.—Before the Mayor (in the chair), Dr. Cardew, Messrs. Hammond Savage, and Hancock.—George Gwillim, dairyman, of 1, Margaret's Hill, was summoned, by adjournment, for selling to Inspector Montagu a half pound of fresh butter to which water had been added. The certificate from the laboratory of Somerset House, to obtain which the case had been adjourned, was as follows:—"We hereby certify that we have analysed the butter and declare the results of our analysis to be as follows: Water, 23·27 per cent.; salt, ·78 per cent.; curd, 1·26 per cent.; butter fat, 74·69. The proportion of water in the sample, without allowing for loss by evaporation, is in excess of that found in recognised commercial samples of butter. The results of our analyses of numerous samples of ordinary commercial butters obtained from different parts of the country, including the South of England, show that the proportion of water present is very variable, and that it occasionally amounts to as much as 19 per cent. (Signed), J. Bell, H. J. Helm, G. Lewin."—The Bench, after a slight consultation, said they considered the case proved, and fined the defendant £10 and costs, or a month's imprisonment.

ALLEGED ADULTERATION OF MILK.—At the St. Columb Petty Sessions, lately, before Messrs. Bennett and Trevan, Samuel Tummon, dairyman, of Newquay, was summoned "for that he on the 17th day of September last, did sell at his house in Newquay, a certain article called milk, which was found on examination by the County Analyst, to be adulterated." Mr. Whitefield appeared for the defendant,

Superintendent Marshall, the prosecutor, stated that on the 17th September last he visited defendant's house, and there saw a bucket partly filled with milk, which defendant admitted was similar to what he had been selling, and told witness the milk was for sale. Witness thereupon purchased three half pints, and informed defendant it was for the purpose of being analysed, as complaints had been made as to the quality of the milk sold in Newquay. Witness divided the milk into three parts and filled two bottles, which he sealed in the manner provided by the Act, and took away the same with him, and left the remainder with the defendant. He subsequently delivered one of the bottles to the public analyst at Truro (Mr. J. H. Collins), and retained the one produced. On the 1st of October he received from the analyst his certificate produced. The certificate was read, which stated that the milk submitted was mixed with at least 20 per cent. of water and contained 3 per cent. of sugar. The analyst expressed his belief that a portion of cream had been removed, and that an ingenious adulteration had been committed. In cross-examination, Superintendent Marshall admitted that he bought the milk for analysis and not for consumption. Mr. Whitefield, in defence, contended that the summons failed to disclose any offence within the meaning of the "Food and Drugs' Act, 1875," and therefore the summons ought to be dismissed. The Bench, after consultation, over-ruled the objection. Mr. Whitefield then argued that, inasmuch as the milk had been purchased for the purpose of analysis, and not for consumption, it was not sold "to the prejudice of the purchaser," within the meaning of the 6th section of the Act. The Bench thought this was a fatal objection, and dismissed the case.—*Western Daily Mercury, Nov. 27th, 1878.*

**CLERKENWELL.**—Frederick Wilson, provision dealer, of 4, Eagle Street, Holborn, was summoned by the St. Giles's District Board of Health for selling adulterated butter. The clerk of the Board appeared for the prosecution, and the evidence of an inspector of the parish showed that on the 17th of November he asked at the defendant's shop for a pound of butter. He paid 1s. 4d. for what he received in answer to his request, and then told the defendant that the stuff would be analysed. The certificate of Dr. Edmund, analyst of the parish, showed that there was no "butter" in the article. It was "animal fat other than butter fat, and not injurious to health." The defendant said he sold it as he received it. He was ordered to pay a fine of 40s., the decision not to take effect until after the decision by the High Court in the special case granted by Sir James Ingham. The Vestry Clerk said that would be heard about February 11th next. The decision was formally suspended until that date. Catherine M'Dermott, milk seller, of 56, the Colonnade, St. Giles's, was also summoned for selling milk adulterated with water to the extent of 18 per cent. The defendant was fined 40s., the decision, as in the previous case, not to take effect until after February 11th.—*Times.*

**BOW STREET.**—**ADULTERATION OF BEER.**—Joseph Howett, of the "Swan and Sugarloaf" public-house, Fetter Lane, was summoned by the Excise for having adulterated his beer by mixing it with "put sugar." Mr. Highmore, from the Inland Revenue, explained that "put" was a term used to define a coarse brown sugar, the refuse of scraping of barrels, which was sold at a cheap rate, and had the virtue of absorbing more water, and imparting a "crispiness" to beer which a finer sugar, sometimes used by brewers, failed to accomplish. He called Mr. James Davis, an Excise-officer, and Mr. G. N. Stoker, analytical chemist of Somerset House, who proved that a sample of beer handed to him by Frederick Partiger, Excise-officer, contained some of the sugar, which he said was used by retail dealers, and sometimes by brewers, as a substitute for malt, to give a "fictitious strength" to their beer. Partiger deposed to having found three bags of the sugar, weighing 5lb, behind a beer-barrel in the cellar, besides forty-three empty paper bags in which sugar had been evidently placed. He tasted the beer "on tap," and also beer which had been just received from the brewers, and he found the former sweeter than the latter. He brought samples of both away, and also a portion of the sugar. In cross-examination by Mr. Montagu Williams, who appeared for the defendant, witness stated that he had not brought any of the samples to the court, and he admitted that, after the summons was served, he called on the defendant and told him it was "not a very serious matter," and advised him to petition the board. Mr. Williams contended that there had been no infringement of the Act, and that no proof of the quality of the sugar was before the Court. Sir James Ingham was of opinion that sugar had been used by the defendant for the illegal purpose of fortifying his beer and giving it attractive qualities which were illegitimate. The fine for this offence was £200, but he would mitigate the penalty to £50.

**LAMBETH.**—**ADULTERATION OF MILK.**—Thomas Bowhill, of Tindall Street, Lothian Road, Camberwell, appeared to a summons taken out by Inspector Sedgley, on behalf of the Vestry, for selling adulterated milk. The milk was purchased of defendant's lad in the street, and the analysis showed it was adulterated with water to the extent of 8 per cent.—Defendant said he had sold the milk as he bought it from the wholesale dealer.—Mr. Chance advised him, as, he observed, he did all others who made the same defence, to obtain a warranty with the milk they purchased. He fined defendant 10s., and 12s. 6d. costs. Thomas Harding, of Sussex Dairy, Bishop's Road, Vassall Road, was fined 40s., and 12s. 6d. costs, for selling milk adulterated with water to the extent of 11 per cent. Samuel Wright, milk seller, keeping a shop in Peckham, was also summoned by Inspector Stevens for a like offence. The milk was adulterated with 19 per cent. of added water. Fined £5, and 12s. 6d. costs. David Lloyd, of Sultan Street,



Camberwell, was also summoned by Inspector Sedgley for selling milk found upon analysis to be adulterated with 21 per cent. of added water. Inspector Sedgley, in answer to Mr. Chance, said defendant supplied the outdoor paupers on orders from the medical officer. Mr. Chance observed that it was bad enough to sell adulterated milk to the ordinary public, but when it was supplied to the very poor, and often sick poor, it was a great deal worse. He ordered the defendant to pay a fine of £10, and 12s. 6d. costs.

**VIOLET POWDER.**—Mr. Lund, chemist, of Rosemary Road, Peckham, appeared to an adjourned summons for having sold violet powder in an adulterated condition. Mr. Marsden prosecuted on behalf of the Vestry. Upon the first hearing, the analysis of Dr. Bernays showed that the powder purchased by Inspector Sedgley consisted almost entirely of sulphate of lime or plaster of Paris, and was not fitted for the purpose to which it is usually put. Mr. Chance said he was hardly satisfied as to what violet powder really should be, and the matter was adjourned. On the adjourned hearing, Dr. Bernays, pointed out that it had been deemed necessary that such an article should be considered a drug. It was being constantly used as an outward application for children. What the best chemists in the kingdom sold as violet powder was made of pure starch scented by orris root. The object of violet powder being used was to prevent irritation and absorb moisture. The article in question would not answer that purpose, but might possibly be used hundreds of times without injurious effects. The defendant said it was not the powder he sold generally. It was some sent in packets from a firm, and, having a showy sort of cover, he had put it in the shop window. The powder he sold, as a rule, was pure. Dr. Bernays examined some of the latter, and said that was so. The defendant stated that he first gave the inspector some of this powder; but, as he said it was not enough, he gave him the packet from the window. Inspector Sedgley said the defendant remarked, when he knew the powder was to be examined, that he would sooner sell some of his own make, as he knew nothing of the nature of the other. Mr. Chance remarked that the inference would be drawn that if the packet was in the window, it was for sale. He only however, called upon defendant to pay 12s. 6d. costs, and advised him not to sell such packets again.

**REMARKABLE CASE OF MILK ADULTERATION.**—A curious case of milk adulteration has occurred at Castlereagh, County of Roscommon. A sample of milk supplied by Bedilia Lecch to the Castlereagh Workhouse was sent to Dr. Cameron, County Analyst, for analysis, who reported that it was adulterated with 16 per cent. of water. A sample similar to that sent to Dr. Cameron had been delivered to the contractor in the usual way (sealed with the Union seal), and a third sample was preserved, also sealed up. When the case came for hearing before the Castlereagh Magistrates, the defendant's solicitor produced certificate from Dr. Tichborne, to whom defendant had sent as alleged the sample of milk given to her. The certificate not being legal evidence the case was adjourned for the production of the analysts, but Dr. Cameron only appeared. Dr. Tichborne's certificate was handed him, and upon reading it, he exclaimed that no milk ever had such a composition as that described in the analysis, which stated that it contained 19.1 per cent. of solids, including 12 per cent. of fats. He said that assuming the analysis to be correct, of which he had no doubt, it was cream, and not the sealed sample of milk which defendant had sent to Dr. Tichborne. Finally it was decided that the third sample of the milk produced in Court should be sent to Somerset House for analysis. On Saturday, the 21st instant, the Court sat and announced that the Somerset House Chemists had confirmed Dr. Cameron's analysis. The defendant was fined the highest penalty, £20 and costs. This case shews that it is in the power of vendors to tamper with the duplicate samples left with them. If ordinary milk had been sent to Dr. Tichborne for analysis instead of cream, it must have appeared as if either of the analysts had made a mistake.

**ANALYST FOR DORSET.**—The question as to the appointment of an analyst for the county of Dorset has been discussed in two of the boroughs during the past few days. Mr. J. Comyns Leach, of Sturminster Newton, has been suggested by the city magistrates as a likely person for the office, and they hint that the boroughs would do well to co-operate in the appointment. In some quarters, however, there is a little demur to this, and it is thought the office should be open—the place being advertised in the usual manner. At the meeting of the Dorchester Town Council recently it transpired that a medical gentleman of the locality, Dr. George, had offered to act as analyst for the borough at a salary of £20 per annum, and 10s. 6d. fee, or a grant of £40 for chemical apparatus, reagents, &c., the apparatus to be the property of the Council. Mr. Emson moved, and Mr. Barnett seconded, the acceptance of the offer. Alderman Galpin proposed as an amendment that before the appointment the terms on which Mr. Comyns Leach would accept the office be ascertained. The Mayor (Mr. A. Pope) expressed himself in favour of a salary of £20 to include the public analysis, and for the private analysis the 10s. 6d. fee as provided by the Act of Parliament. Further conversation ensued, and eventually it was agreed, on the motion of Alderman Lock, seconded by Alderman Galpin, to postpone the appointment. At a meeting of the Poole Town Council it has been agreed unanimously to co-operate with the county in the appointment of Mr. Leach, subject to approval as to terms.

At the last meeting of the Middlesex magistrates the "prejudice to purchaser" question was referred to by Sir J. H. Maxwell who said that he thought it was not probable with the strongly declared views, that the Lord Chief Justice of England would be likely to alter his opinion. He had spoken to two or three members of the House of Commons upon the subject, and when the words were proposed "without prejudice to the purchaser," they opposed their insertion in the Act as they foresaw the result that would occur. An analyst was appointed every year at a high salary for the purpose of carrying out the Act, but at present his hands were tied altogether. After the passing of the Act a number of articles were sold pure in consequence of the prosecutions, but if that Act was to be abrogated the same system of adulteration would soon be revived, and he thought the Court should take action in the matter for the purpose of obtaining an amendment of the Act. He therefore moved, "That in the opinion of this Court the Sale of Food and Drugs' Act, 1875, requires amendment in order to render proceedings for selling adulterated articles more simple and effectual; and a copy of this be sent to the Secretary of State for the Home Department."

Mr. Forsyth, M.P., seconded the motion, and remarked that, however adulterated an article, on analysis, might be found to be, with the present ruling a conviction could not be obtained, as it could not be shown that it had been purchased to the prejudice of the purchaser, and he saw no remedy but fresh legislation, as he had no doubt that the opinion of the Lord Chief Justice would be followed all over the country.

After some discussion the motion was then put, and negatived by 14 to 6.

#### NOTES OF THE MONTH.

The great violet powder question is still as far off settlement as ever, for on the one hand, we have the Salford magistrates in quarter sessions assembled, solemnly declaring on the evidence of Dr. Redwood, that violet powder is anything which persons may choose to sell, while on the other, we have a London stipendiary magistrate holding on the statement of Dr. Bernays, that violet powder is and should be only starch scented with orris root. It appears to us, as independent spectators, that this is just one of these cases, where, by a little judicious manipulation, the supreme Court may be induced to decide either way, and any number of scientific witnesses may be called on each side. To make our proposition clear, let us for a moment try to trace the real position of violet powder, at the date of the passing of the sale of Food and Drugs' Act. The best evidence which can be had as to what this article should really be, is that of a respectable and qualified class of men like the pharmacists. Now it so happens that we have special opportunities of gathering the opinions of such men, and with the view of obtaining reliable data as to the recognised composition of this and other similarly mis-named articles, we have for some years been making the enquiry, "How do you make violet powder?" and registering the result. This question has been put to nearly one thousand practical pharmacists, and the answers may be summarised as follows:—

Starch and orris root	...	...	...	...	70 per cent.
Starch, orris root and various perfumes	...	...	...	...	5 "
Starch, orris root and magnesia	...	...	...	...	20 "
Starch, orris root, and French chalk, or magnesia and	...	...	...	...	5 "
French chalk	...	...	...	...	5 "
					100 per cent.

It is thus perfectly clear, that, as really made by chemists themselves, the base of true violet powder is starch. But of late years, since the advantage of advertising apparently cheap articles in packets has become evident, a class of houses have sprung up who make such packets and supply them extensively to oilmen, perfumers and others, not licensed chemists. This seriously interferes with the legitimate business of the pharmacist, and he is, in certain districts, compelled in self-defence to vend such packets, as he cannot

sell his own articles at the price for which these may be obtained from the oilmen. It is in the packet powder that the happy idea of vending purely mineral ingredients, such as sulphate of lime, selenite &c. has been developed, and the present fight is not between the true pharmacists and the authorities, but, between the producers of each articles and those who desire to see the legitimate preparation of the chemists maintained. It is therefore evident, that when requiring scientific evidence for the defence, such as that offered by Professor Redwood, it is simply necessary to collect and send to your witness packet powders only, and then he cannot help stating the fact, that sulphate of lime is the chief ingredient. On the other hand, let one hundred samples of violet powder be bought from chemists only, (not in packets, but of their own manufacture,) and submitted to the same analyst, and he would be obliged to tell a perfectly different tale in the witness box. The whole thing turns on the question, ought scented mineral powders in packets, sold by anyone, to be allowed to take the place in the public mind, of the article usually prepared by the chemists themselves, without compelling the adoption of some distinguishing title, such as "mineral violet powder," or, selenite dusting powder?" We make these remarks, in order to show how difficult it is to have the honest facts of any case brought clearly before a Court of Law. Meantime we think it is a question, looking to the state of the present case, whether it is wise for analysts to give certificates without clearly stating that violet powder is at the moment an article entirely destitute of a true standard of purity. For their own sakes, some respectable pharmacists should combine and have a test case thoroughly argued and carried to the Supreme Court, by which means they might get rid of the packet incubus, so far as having a definite line of demarcation laid down between genuine violet powder prepared with starch, and mineral dusting powders, and then the rest must remain with the public themselves to choose between quality and price.

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We print a report of a case dismissed under the prejudice to purchaser quibble, which is interesting, as showing that our unsophisticated country dealers are quite as wide awake as the London purveyors of milk. Mr. Samuel Tummon must be looked upon with the greatest respect, as a man who has deeply studied his subject, and calls chemistry to his aid, by adding to his milk a solution of sugar, having exactly the specific gravity of the genuine article. Henceforth, the sign of the scientific milkman should contain the notice, "Dairy Laboratory entrance next door!"

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The butter case at Bath (reported in our legal columns) must be looked upon as an immense step in the right direction, for we have here a definite standard of 19 per cent. as the amount of water in butter laid down by the Inland Revenue Chemists, and henceforth, analysts and the appeal chemists will be in accord on this point. It is a strong argument in favour of the idea, that one of the most beneficial amendments which could be made in the Act, would be an instruction to the Central Authorities to issue from time to time a set of standards to all. They have at Somerset House the necessary staff and time to verify the standards already fixed by our Society, and we are sure that all analysts would be only too glad to accept them, when so verified, and so avoid differences of opinion, which are always to be deplored.

To show how close the analysis of a public analyst and that of the Somerset House Chemists can run, even when one sample has been kept some time before analysis, we give side by side the figures of both analysts in this case.

	Mr. Gatehouse.	Messrs. Bell, Helm, and Lewin.
Water ... ..	25·00	23· 7
Salt ... ..	·88	·78
Curd ... ..	1·16	1·26
Butter Fat ... ..	72·96	74·69
	<u>100·00</u>	<u>100·00</u>

It is thus obvious that given a publication of standards such as that already invited by the Society of Public Analysts, the disagreements between them and Somerset House, which still occasionally occur, would be at an end for ever.

The *Brewers' Guardian* reminds us of Bret Harte's heathen Chinese. We can picture the smile of innocence, "child-like and bland," which adorned the countenance of the respected Editor of that excellent publication, when he wrote the following:—

"The Adulteration Act having become a dead letter in consequence of the decision of the Court of Queen's Bench upon the "prejudice" question, we may naturally expect some alteration in the law next session. Three hundred years ago the authorities in various towns took steps to ensure a supply of pure ale and beer to the public; in those days there were no public analysts, but the officials were called 'ale-tasters.' In 1529 the Mayor of Guildford ordered that 'the brewers make a good useful ale, that they sell none until it be tasted by the ale-taster.' These officials had to take the following oath:—'You are chosen ale-tasters of this town. You shall well and truly serve his Majesty and this town, in the same office. You shall at all times try, taste and assize the beer and ale to be put to sale in this liberty, whether the same be wholesome for man's body, and present those that offend, or refuse to suffer you to assay it. You shall give your attendance at all courts, and present from time to time the offenders, and all things else belonging to your office you shall do and execute. So help you God.' The records do not tell us whether the 'prejudice' question was raised in those days. This practice of 'ale-testing' is still in existence in some places at the present time. For instance, we read in a contemporary that at the annual court leet of the Earl Bathurst at Cirencester the other day, Messrs. Harding and Kitton, the 'ale-tasters,' asked to be relieved from their office, on the ground that they were getting old men, and wished someone else to take their places. They handed in a certificate which set forth that the 'ale and beer has been better this year than last, and they consider it to be in fair condition,' &c. They stated that they had held their office for two years, and during that period they declared they had done their duty as 'ale-tasters' most conscientiously. This being the case, and the ale being so good, Messrs. Harding and Kitton were reappointed. *We are disposed to think that the quality and purity of beer would be quite as well sustained by such 'ale-tasters' as by the system of local inspectors, analysts, and others, provided for in recent Acts of Parliament.*"

No doubt, Mr. Brewer, you would like to return to the middle ages, and so be able to "improve" your beer and to make it agreeable to the palate, without the interference of such an impertinent and obtrusive science as chemistry, to tell the public how you do it. We thank our friend for his capital little piece of ingenuousness.

So as to show the superiority of the old processes adopted by the "ale-tasters," we give a curious piece of information, which we once came across while reading up ancient food customs in the Library of the British Museum. It seems, that in common with most persons, the "ale-tasters" wore leather breeches, and when they went to test the ale for the presence of sugar, a pint of the fluid was spilt upon a well-cleaned bench, and the taster sat upon the same till it dried. If on rising, the leather continuations

stuck to the bench, then sugar was present, but if not, the beer was pure. This is a specimen of the ancient accuracy of manipulation, to which the *Brewers' Guardian* would fain return!

Our readers will peruse with interest the paper by Mr. Thomson, on the peculiar ferment produced in yolk of egg by the morbid growth of bioplasm. We sincerely hope that the New Year will not only prove a happy and prosperous one to our subscribers, but also a scientifically profitable one, during which, they will each turn their attention to some point in the analysis of food and drugs, and by sending us their results, advance the great sanitary cause in which we are all fellow-workers. Many a little makes a muckle, says the Scotch proverb, and no new light thrown on any process, but will find welcome to our columns.

We wonder what can have been the state of mind of that student who, at a recent examination at one of our hospitals, in answer to the question, "Explain the difference between the chemical and physical properties of matter, and give one or two examples in illustration," gave the following gem of an answer:—"The differences between these two properties of matter are, I may venture to say, enumerable (*sic*); first, one possesses life, *heat*, organs, structure, and various others; the other is lifeless, without heat or organs, structureless. Another difference is in the appearance. Example:—Animals a mere composition—live in a higher state—of physical matter presents a most striking contrast to water, though the same chemical elements which enter into the combination of water forms by far the greater part of animal composition."

#### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price.
1761	H. J. Haddan ... ..	Treating Wool, Silk. &c. ... ..	2d.
1800	J. Holden ... ..	Receptacles for Storing Liquids ... ..	4d.
1855	M. M. Prager ... ..	Manufacture of Leaven or Yeast ... ..	4d.
1874	F. J. Cheesborough ... ..	Manufacture of Sulphate of Lime ... ..	4d.
1889	A. R. Molison ... ..	Lighting Gas Jets by Electricity ... ..	2d.
1894	H. E. Newton ... ..	Dyeing Animal Substances ... ..	2d.
1904	J. F. Farquhar and J. B. Macfarlane ... ..	Treatment and Purification of Sugar ... ..	6d.
1943	W. Browne ... ..	Manufacture of Silicate Cotton Cloth ... ..	6d.
2052	C. Graham ... ..	Effecting the Fermentation of Solutions Capable of Yielding Alcohol ... ..	6d.
2106	R. Martin ... ..	Manufacture of Gas ... ..	6d.
3250	H. Wilde... ..	Producing and Regulating Electric Light ... ..	6d.
3804	J. F. Bailey ... ..	Speaking Telephones ... ..	6d.

#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Examiner; The Medical Times and Gazette; The Pharmaceutical Journal; The Sanitary Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Boston Journal of Chemistry; The Dairyman; The American Dairyman; The Practitioner; Bayley's Chemist's Pocket Book; The House Surgeon, or the Doctor at Home; Manual of Practical Chemistry, by A. W. Blyth.

# THE ANALYST.

FEBRUARY, 1879.

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## SOCIETY OF PUBLIC ANALYSTS.

THE ANNUAL MEETING of this Society was held on Wednesday, the 15th January at Burlington House, Piccadilly, Dr. Dupré, F.R.S., in the chair.

The minutes of the previous meeting were read and confirmed.

The Treasurer presented the accounts for the year, audited, and expressed his satisfaction at the financial position of the Society, as compared with last year.

Dr. Bostock Hill and Mr. A. Ashby, were appointed Scrutineers to examine the voting papers, and they reported that the following gentlemen had been elected as President, and Vice-presidents, &c., for the present year.

### *President.*

J. MUTER, PH.D., M.A., F.C.S.

### *Vice-Presidents.*

A. DUPRE', PH.D., F.R.S., F.C.S.

J. W. TRIPE, M.D.

J. C. BROWN, D.Sc., F.C.S.

### *Treasurer.*

C. W. HEATON, F.C.S.

### *Hon. Secretaries.*

CHARLES HEISCH, F.C.S.

G. W. WIGNER, F.C.S.

### *Other Members of Council.*

M. A. ADAMS, F.R.C.S.

A. H. ALLEN, F.C.S.

A. WYNTER BLYTH, M.R.C.S., F.C.S.

A. H. CHURCH, M.A., F.C.S.

A. HILL, M.D., F.C.S.

E. W. T. JONES, F.C.S.

F. MAXWELL LYTE, F.C.S.

C. H. PIESSE, F.C.S.

W. C. YOUNG, F.C.S.

Those Members of Council whose term of office has not yet expired, and who do not retire this year, are C. A. Cameron, M.D.; H. C. Bartlett, Ph.D., F.C.S.

The Scrutineers also reported that Mr. J. Baker Edwards, Ph.D., F.C.S., Public Analyst for the District of Montreal, Canada, and Mr. R. G. Fraser, Public Analyst for the District of Halifax, Canada, had been elected Members of the Society.

Dr. Dupré then read his valedictory address, as follows:—

When, two years ago, you did me the honour of electing me your President, the fortunes of our Society were at a very low ebb, our numbers were not increasing, and our finances were in anything but a satisfactory condition. Now, thanks mainly to the exertions of one of our secretaries, Mr. Wigner, our condition is very materially improved. Our darkest days are, I believe, over, for the present at least, and I can vacate this chair in favour of my successor, with the pleasing conviction that he will begin his term of office under more favourable conditions than obtained two years ago.

We have now 90 members and 10 associates, 17 members and 1 associate having been elected during the year. On the other hand, we have unfortunately lost three members by death, namely, W. Baker, E. H. Jones, and J. Wiggin; one member has resigned and one has been struck off. One associate has also resigned.

The number of papers read at our meetings or contributed by members to THE

ANALYST also show an increase, having been 35 last year against 33 the previous year. As regards our finances, we have now a balance of £13 in hand, whereas at this time last year we were in debt to the amount of £10. All this is highly satisfactory, and I trust we may continue in the same path.

The Society has now been established about four years, and although it may be too early, as yet, to affirm that it has proved its claim to permanent existence, we may at least say, without fear of contradiction, that it has done much good and useful work during that time. Indeed, had our Society not existed, it is not too much to say that the Sale of Food and Drugs' Act could not have been worked with anything like the success it has been. Not only has our Society disseminated among its members the knowledge of processes (old as well as new), devised by chemists in every part of Europe and America, but the contributions of our members to the branch of practical chemistry relating to the testing of foods, drinks, and drugs, are among the most valuable that have been made to that branch of chemistry during the last four years. Much, however, still remains to be done before our means of grappling with what might be called the art of adulteration, can be said to rest on a thoroughly satisfactory basis, and until such is the case a Society like ours is, I believe, a necessity. We may, therefore, confidently look forward to, at least, a number of years of useful and prosperous existence.

When the Society was first established many of the public analysts that had been appointed were, without doubt, less acquainted with the duties they were called upon to perform than was at all desirable, but this was almost unavoidable. The study of processes adapted for the detection of adulteration in foods and drinks had been very greatly neglected, and I believe there was not a single public laboratory in the country in which such processes were taught. Every public analyst had, therefore, to study such processes by himself as occasions arose, in many cases after his appointment. Now, however, this state of things has in very great measure passed away, thanks mainly to the labours of our Society, and public analysts form, on the whole, as efficient a body of men, for the performance of the special duties cast upon them, as could reasonably be expected.

We have, of course, not escaped serious criticism and even abuse, more particularly at the hands of interested trade journals, but this need not be wondered at. The business of our members is to render adulteration impossible, and all engaged in the nefarious work of adulteration, be they milk dealers, grocers, or pharmaceutical chemists, will, of course, cry out against us. Fair criticism, even if very severe, is useful, and ought to be encouraged and welcomed, but, unfortunately, much of the criticism we have been exposed to has been the reverse of fair, though often very strong. One very common misrepresentation I would take this opportunity of denouncing most emphatically. Public analysts are often abused as prosecutors, as if they not only analysed the samples brought to them, but bought them and acted as prosecutors as well. Now, nothing can be further from the truth. The public analyst, as we all know, and as anybody might learn, neither buys the samples, nor, in the majority of cases, even suggests what samples are to be bought, and he has absolutely nothing whatever to do with the prosecution. All he does is to analyse the samples brought to him, and to give a certificate in accordance with the results of his analysis. He does not know from whom the samples have been bought, as they are merely distinguished by a number or other mark, and he cannot, therefore, by any possibility, be biassed one way or the other.

During the past year there have been rather fewer differences between public analysts,

on the one hand, and the Somerset House Chemists—the chosen court of referees—on the other. This is probably, in part at least, owing to the more careful work of public analysts in general, but in greater part, I believe, it is due to the fact that the referees are gradually learning the new work cast upon them by the Sale of Food and Drugs' Act, even as public analysts had to learn theirs. In time, no doubt, substantial agreement will be arrived at, and such time would be materially shortened if the authorities at Somerset House were to instruct their chemists fairly to meet the wishes of this Society, as expressed in the letter of the Secretaries of 22nd January, 1878. As it is, our proceedings being public, all analytical processes used by our members, as well as the various standards, or rather limits, adopted or proposed by our Society, often after much discussion, and representing always a very considerable amount of experience, are open to anybody to challenge or disprove. But our conclusions thus publicly arrived at may be overridden, because a small number of experiments, deemed by the few chemists at Somerset House to be conclusive, are apparently not in accord with our conclusions, but instead of bringing these alleged facts forward for general discussion, they keep them in the drawers of the Somerset House Laboratory, to be brought forward only when some public analyst has to be proved wrong. Such a state of things is eminently unsatisfactory. A court of referees to appeal to in disputed cases, is perhaps a necessity, and at all events is highly desirable, but all the factors with which it works should be open to the fullest discussion, otherwise it is impossible for those affected by its decisions to have confidence in its competency. It is no doubt true that anyone who goes to the Somerset House Laboratory is shown, with the greatest politeness, the various analytical results on which reliance is placed. But facts so obtained are, by the very manner in which they are obtained, beyond the pale of public discussion, and it is impossible to criticise them. The present referees seem also often to forget that it is their primary duty to protect the public against the nefarious practices of the adulterating manufacturer or tradesman.

A serious interruption to the working of the Act was caused last year in various districts in England, owing to the fact that many magistrates recognised as a valid defence the plea that an inspector cannot be said to be prejudiced if he receives an adulterated article. Had this plea been universally recognised, the Sale of Food and Drugs' Act would have been a dead letter. The case will soon be argued before one of the higher courts, and the decision to be pronounced will, no doubt, set the point at rest, either by refusing to recognise the validity of the plea, when, of course, everything will go on as heretofore, or by recognising it, compel Parliament to pass a short amending Act.

Another interesting case will also shortly be heard, on appeal from one of the magistrates in my district, namely, whether, in selling an entirely fictitious article (artificial butter in this case), it is sufficient for the dealer to wrap the article in a paper, on which is printed, in somewhat small type, and not in a conspicuous place, "Notice, this compound is sold as imported and declared according to the Act section 8," without any intimation to the buyer that he is not obtaining what he asked for. It is to be hoped that Mr. Woolrych's decision will be upheld.

A somewhat striking case, showing the importance of continuous supervision, which has come under my own observation, may not be un-interesting to many. By the direction of the District Board nine samples of milk were bought one Sunday morning, and brought to me for analysis. Out of these nine samples two only were fairly good while seven were largely adulterated, two of them consisting of milk and water, in



about equal proportions. A fortnight later, nine more samples were bought, but by this time the dealers had taken the alarm, and one sample only was found adulterated. Taking the average for the last two or three years, rather less than one in five has been found adulterated, but these were always bought on week-days, and the above was the first Sunday experiment.

Before vacating this chair, I would once more earnestly entreat all our members to aid in the general usefulness of the Society, by bringing as much as possible of their work, as Public Analysts, before our meetings. It is not to be expected that many of our members can spare the necessary time for elaborating new processes of analysis, but everyone, without exception, can aid in the improvements of already established methods, by bringing forward his personal experience, and let nobody think that his experience may not be worth publication. Every observed fact is of value, and it is only by the co-operation of many that any great advance can be made. Even if no entirely new fact can be brought forward, much good might be done if members generally would favour us with some of the results of their yearly work, giving us, say, the compositions of the various *pure* articles they have examined during the year. We should then, as a Society, soon be in possession of a series of chemical statistics relating to all kinds of food, drink and drugs, which would be invaluable to all engaged in their examination—such a series as could not be matched anywhere.

And now, it only remains for me to thank you once more most heartily for the honour you did me in electing me your President; the occupation of this chair has been to me a great pleasure, and I trust that it may not have been without some benefit to the Society.

Dr. Muter then moved "That this Society desires to express its hearty thanks to the retiring president, Dr. Dupré, for the marked ability and courtesy with which he has uniformly conducted the business of the Society," and in doing so alluded to the able and temperate way in which Dr. Dupré had always managed the meetings, and the great chemical knowledge and skill shown in the remarks he made on the various papers read before the Society.

Mr. Heisch seconded the resolution, which was carried unanimously.

Dr. Dupré having briefly replied,

Mr. Hehner proposed, and Dr. Bostock Hill seconded, "That the thanks of this Society be presented to the Officers and Members of Council for their attention to the business of the Society during the past year."

Mr. Heaton returned thanks.

Dr. Dupré proposed, and Dr. Alfred Hill seconded, "That this Society desires to express its hearty thanks to the Council of the Chemical Society for the gratuitous use of their rooms for general and council meetings during the past year," and the Secretaries were directed to transmit a copy of the resolution to the Council of the Chemical Society.

Dr. Dupré then vacated the chair, which was thereupon taken by

Dr. Muter, who, in returning thanks for being elected to that seat, said he felt very unworthy of the honour, but trusted that his attention to the interests of the Society would be such as to make him worthy of it.

Mr. O. Hehner read a paper "On the determination of Phosphoric Acid as Phospho-molybdate," and Mr. Allen and Dr. Muter joined in the discussion which ensued.

Mr. Wigner read a paper by Mr. E. W. T. Jones, "On the influence of the Decomposition in Butters from age on the Specific Gravity of the Fat, and the percentage, of Soluble and Insoluble Acids," and also a paper by Dr. J. M. Milne, "On Butter Analysis."\*

As there were several Members who desired to make some remarks on the subject, the discussion on these papers was adjourned until the February Meeting.

After the meeting the Annual Dinner was held at the Café Royal, Regent Street, when the members and several friends passed a very agreeable evening.

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The next Meeting of the Society will be held on February 19th, at Burlington House.

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### ON THE DETERMINATION OF PHOSPHORIC ACID AS PHOSPHO-MOLYBDATE.

By OTTO HEHNER, F.C.S.

*Read before the Society of Public Analysts, on 15th January, 1879.*

In bringing this communication before the Society of Public Analysts I am well aware that the subject has already been treated of by several chemists, and I also bear in mind that the method of determining phosphoric acid as phosphate of magnesia is an excellent one when performed under the conditions and with the precautions which have been worked out of late years. Yet the precipitate of phospho-molybdate of ammonia is a particularly tempting one to found upon it a method for the quantitative determination of phosphoric acid, since it contains, in combination with a very small quantity of phosphoric acid, an exceedingly large proportion of molybdic acid and other constituents; and because it is but very little soluble, and can be precipitated from acid media.

Molybdic acid has long been employed both for the detection and for the separation of phosphoric acid for quantitative purposes, especially from such bases as are precipitated by ammonia or by phosphoric acid. But owing to the alleged variable composition of the precipitate it has not hitherto been utilised with any measure of success for the direct determination of  $P_2O_5$ , although several attempts have been made.

In going into this matter I have carefully perused everything accessible to me which has been written on the subject, and I will as briefly as possible give a list of the more important papers treating on it.

Svanberg and Struve (Jahresb, 1847, p. 412) first made the observation, that molybdate of ammonia produces a yellow colouration or precipitate in the presence of phosphoric acid. They did not, however, recognise that the  $P_2O_5$  was an essential constituent of the precipitate, to which they assigned the formula  $(NH_4)_2O, 5 MoO_3 + H_2O$ .

It was Sonnenschein (Jahresb, 1851, p. 349) who first proved that the  $P_2O_5$  was a normal constituent, and he utilised the precipitate for the quantitative determination of the  $P_2O_5$ , and essentially his method is still employed at the present time. It consists in the precipitation of the  $P_2O_5$  in concentrated solution, by an acid solution of  $MoO_3$ , washing the precipitate with dilute molybdic solution, dissolving it in ammonia, and,

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\* Owing to the pressure on our space this month we are compelled to hold over these papers until our next number.

precipitating the  $P_2O_5$ , by means of magnesia mixture. According to Sonneaschein the precipitate contains 3 per cent of  $P_2O_5$ .

According to Nutzinger (Jahresb, 1855, p. 374) the composition of the dried precipitate (at  $100^\circ C$ ) is 3.82 per cent.  $P_2O_5$ , and 92.70 per cent.  $MoO_3$ . Seligsohn (Journ. f. Pract. Chem., vol. 67, p. 470) shows, in a very careful examination, that the precipitate dried at  $100^\circ C$  contains 3.142 per cent.  $P_2O_5$ , 90.744  $MoO_3$ , 3.570  $(NH_4)_2O$  and 2.544  $H_2O$ . He assigns to it the formula  $2(3(NH_4)_2O, P_2O_5) + 15(H_2O, 4 MoO_3)$ .

Sopp (Pogg. Annal. 109, p. 136) finds 3.20  $P_2O_5$ , 86.0  $MoO_3$ , 5.91  $(NH_4)_2O$  and 4.91  $H_2O$ . He first attempted the direct determination of the  $P_2O_5$  by measuring the precipitate in graduated tubes.

Lipowitz (Ibid) explains the variable composition of the precipitate, as apparent from the varying statements quoted above, by saying that  $MoO_3$  is invariably mixed with the phospho compound, and he therefore prepares a molybdic solution, by the addition of tartaric acid to Sonnenschein's solution, and boiling, which would not deposit free  $MoO_3$ . He collected the precipitate on a weighed filter, washed with dilute  $HNO_3$  and dried over oil of vitriol. He states the average amount of  $P_2O_5$  in the precipitate to be 3.607 per cent. Even if this way of procedure were capable of furnishing accurate results it would be quite impracticable, on account of the drying over  $H_2SO_4$  it entails. Tartrates, moreover, act most inimically to the complete precipitation of the  $P_2O_5$ , more so than any other salts.

Boussingault, however, asserts, without proof, as far as I can ascertain, that  $P_2O_5$  can be more correctly determined by the direct weighing of the phospho-molybdate precipitate than by conversion into the magnesia compound. When this statement was made the magnesia method was certainly far from perfect. According to Boussingault the precipitate contained 3.73 per cent. of  $P_2O_5$ .

Eggerts (Journ. Pract. Chem., 1860, p. 498) finds in the precipitate dried at  $95^\circ C$  3.74 per cent.  $P_2O_5$ . He states that when dried above that temperature decomposition takes place, with the probable formation of pyrophosphate. He washes the precipitate with water to which 1 per cent. of  $NHO_3$  has been added and dries at  $95^\circ C$ , or measures the precipitate in a narrow tube.

He asserts, that the precipitate is never crystalline, even when viewed with high powers of the microscope, and he also states that with 0.0017  $P_2O_5$  in 15 c.c. of water 4 c.c. of molybdic solution produce no precipitate. Both these statements, as well as his solubility determinations given below, are erroneous.

Rammelsberg, (Berl. Ber., 1877, p. 1776) finds in the dried precipitate (at  $100^\circ C$ ) 3.90 per cent.  $P_2O_5$ , 86.45 per cent.  $MoO_3$ , 3.25  $(NH_4)_2O$ , and 5.77  $H_2O$ .

Apart from other and less reliable statements we have therefore in the yellow precipitate, according to

Nutzinger	...	...	...	...	...	...	3.82 per cent. $P_2O_5$
Seligsohn	...	...	...	...	...	...	3.14 "
Sopp	...	...	...	...	...	...	3.20 "
Lipowitz...	...	...	...	...	...	...	3.61 "
Boussingault	...	...	...	...	...	...	3.73 "
Rammelsberg	...	...	...	...	...	...	3.90 "
Eggerts	...	...	...	...	...	...	3.74 "

Or 1 part of  $P_2O_5$  furnishes from 25.64 to 31.84 parts of yellow precipitate.

I had practically completed my investigation when I noticed in one of the most

recent numbers of the Berl. Berichte that Finkener had worked out a method such as I had in view. I shall have occasion to refer to it further on.

My object then was to find out the reason for that variation in the composition of the precipitate, and to study, if possible, the conditions under which it could be obtained of constant composition.

On examining a very large number of phospho-molybdate precipitates obtained in the ordinary course of analysis, by means of the microscope, I very often discovered side by side with the yellow and distinct crystals of the phospho compound colourless acicular crystals of molybdic acid, and I have therefore no doubt that Lipowitz's explanation is correct. The quantity of the  $\text{MoO}_3$  crystals is the larger the higher the temperature at which the precipitate is obtained. I may mention that phospho-molybdate crystallizes, usually, in very distinct but minute and almost granular crystals, apparently belonging to the hexagonal system; but sometimes beautiful six-rayed stars of great regularity are obtained.

In all of my experiments I precipitated at the lowest possible temperature, at most 80 or 35°C. I avoided all excess of acid, especially of free H Cl, neutralising it, as far possible, with  $\text{NH}_3$ .

The molybdic solution employed was prepared according to Fresenius, namely, by dissolving 1 part of molybdic acid in 4 parts of ammonia of 0.96 sp. gr., and pouring the solution thus obtained slowly into 15 parts of  $\text{HNO}_3$  of 1.2 sp. gr., avoiding all rise of temperature. This solution contains 5 per cent. of molybdic acid. It may be warmed, indeed, almost boiled, both in its concentrated state or when diluted, for many hours, without depositing any  $\text{MoO}_3$ .

I determined not to weigh the precipitate directly, as had hitherto been done, but to dissolve it in ammonia, to evaporate this solution and to ascertain the weight of the residue. I thus avoided the clumsy and troublesome scraping out of the precipitate from the beaker, to which, as a rule, it clings most obstinately, and substituted for that operation one involving practically no risk of loss. I also obviated the collection on a weighed filter. Thus I really weighed (at least in my earlier experiments) a mixture of molybdate of ammonia and of phosphate of ammonia, thus decreasing still further the proportion of the  $\text{P}_2\text{O}_5$  in the substance.

It is plain that I could not employ for the washing of the precipitate the usual acid liquid containing molybdate of ammonia, but was obliged to remove all acids, and, indeed, all soluble matter. But it is stated that the yellow precipitate is soluble to some extent in any of the menstrua which were thus left to me, notably in water and in alcohol. Besides, I found, that on washing with water, the precipitate almost invariably ran through the filter as soon as all acid had been removed.

According to Eggerts 1 part of the precipitate is soluble in 10,000 parts of water, in 6,600 parts of 1 per cent. nitric acid and in 620 of alcohol of 0.80 sp. gr.

I digested some of the yellow precipitate, which had been shown by the microscope to be free from crystals of molybdic acid, with water, alcohol of 90 per cent. and alcohol of 45 per cent., for some weeks, shaking frequently. The temperature during that time varied, but was, when I ultimately filtered, about 14°C. I found one part of the precipitate to require for solution of

Water ... ..	21,186 parts.
Strong Alcohol ... ..	8,117 "
Dilute Alcohol ... ..	13,513 "

Since about 28 parts of the precipitate contain 1 part of  $P_2O_5$ , no less than 593,200 parts of water, or 378,000 parts of dilute alcohol, are necessary to dissolve 1 part of  $P_2O_5$  in that form. Or assuming that 100 c.c. of water or dilute alcohol were employed for washing a precipitate, and usually a smaller quantity would suffice, no more than 0.00017 or 0.00026 gm.  $P_2O_5$  respectively could be dissolved, assuming that by filtration alone a saturated solution could be obtained, which is undoubtedly *not* the case. The solubility of the yellow precipitate in water or dilute alcohol may therefore be safely disregarded, and my experiments will show that no influence whatever can be traced to the employment of these liquids.

I prefer to use dilute alcohol, because with it the precipitate is not apt to go through the filter, at least not when the latter is of a sufficiently close and tight texture.

I prepared a dilute solution of phosphate of soda, and determined in it, as carefully as possible, the amount of phosphoric acid, both by evaporation and by precipitation with chloride of magnesium mixture. I have entirely discarded sulphate of magnesia mixture, because absolutely exact results cannot be obtained when it is used, as has been shown over and over again—(see Abesser, Jani and Märcker, *Zeitschr. f. Anal. Chem.*, 1873, p. 243; Fresenius' *Quantitative Analysis*, 6th edition, p. 403, etc.)—the results being as a rule *too high*.

*Exp. 1.* 50 c.c. phosphate solution gave 0.0215 pyrophosphate of soda, containing 0.01147 gm.  $P_2O_5$ .

*Exp. 2.* 50 c.c. furnished 0.0213 pyrophosphate of soda or 0.01136 gm.  $P_2O_5$ .

*Exp. 3.* 50 c.c. precipitated with magnesium mixture yielded 0.0184 gm.  $Mg_2 P_2 O_7 = 0.01176 P_2 O_5$ .

*Exp. 4.* Obtained from 50 c.c. 0.0182 gm.  $Mg_2 P_2 O_7$  containing 0.01164 gm.  $P_2 O_5$ .

The  $P_2 O_5$  found fluctuated therefore from 0.01136 to 0.01176, the average being 0.0115  $P_2 O_5$  in 50 c.c.

*Exp. 5.* 50 c.c. were concentrated to about 20 c.c., and precipitated, at a temperature of about 30 with 60 c.c. molybdate solution. After 10 hours the precipitate was separated by filtration, washed with alcohol, care being taken to pour as little as possible of the precipitate upon the filter, dissolved in  $NH_3$  and the solution evaporated, the solution being kept strongly alkaline to the very end of the evaporation. The residue was dried at 100°C until the two last weighings agreed within 1 Mgrm. Obtained 0.3435 grms. residue, or 1 part of  $P_2 O_5$  yielded 29.87 parts residue.

*Exp. 6.* As above. Obtained 0.3426 residue, 1  $P_2 O_5$  therefore gave 29.79 parts residue.

*Exp. 7.* As above. Obtained 0.3536 residue, 1  $P_2 O_5 = 30.75$  parts residue.

*Exp. 8.* As above. 25 c.c. of alcohol were used for washing. Obtained 0.3549 residue, or 1  $P_2 O_5 = 30.86$  residue.

*Exp. 9.* As above. 50 c.c. of alcohol used for washing. Residue weighed 0.3543 grms. or 1  $P_2 O_5 = 30.81$ .

*Exp. 10.* As before. 100 c.c. alcohol used for washing. Residue 0.3487; or 30.32 residue from 1  $P_2 O_5$ .

*Exp. 11.* 100 c.c. phosphate solution evaporated to about one half, and precipitated with 75 c.c. molybdic solution. Result 0.6877 residue, or 1  $P_2 O_5 = 29.90$  parts residue.

*Exp. 12.* 100 c.c. phosphate solution, precipitated without concentrating it first, with 75 c.c. molybdic solution. 0.6971 gm. residue. 1  $P_2 O_5 = 30.31$  residue.

*Exp. 13.* 25 c.c. phosphate solution, 25 molybdic solution and 25 c.c. dilute nitric acid, yielded 0.1741 residue, or 30.28 residue from 1  $P_2 O_5$ .

*Exp. 14.* 2 c.c. phosphate, containing no more than 0.00046  $P_2 O_5$ , 50 c.c. water, and 10 c.c.  $MoO_3$  solution gave 0.0141 gm. residue or 30.65 parts from 1  $P_2 O_5$ .

In all these cases, I took care not to allow the bulk of the liquid to become too small, as by concentration  $MoO_3$  would become precipitated. I obtained, on the average, from 1 part of phosphoric acid 30.35 parts of residue, or 100 parts of residue contain

3.295 of  $P_2O_5$ . Dividing the quantities of residue obtained by 30.35, we obtain the following amounts of phosphoric acid:—

				Taken.		Found.
5	...	...	...	0.0115	...	0.0113
6	...	...	...	0.0115	...	0.0113
7	...	...	...	0.0115	...	0.0116
8	...	...	...	0.0115	...	0.0117
9	...	...	...	0.0115	...	0.0117
10	...	...	...	0.0115	...	0.0115
11	...	...	...	0.0230	...	0.0227
12	...	...	...	0.0230	...	0.0230
13	...	...	...	0.00575	...	0.0057
14	...	...	...	0.00046	...	0.00046

It will be observed, that without adopting any special precautions against admixture of  $MoO_3$  with the yellow precipitate taking place, except avoiding high temperatures or great concentration, very tolerably constant results were obtained, more constant in fact, than could have been yielded by the magnesia process.

The following experiments however will show clearly that the process as hitherto used by me was somewhat defective.

A solution was made of 1.9763 grm. of a phosphorite in 250 c.c. after due separation of the silica.

*Exp. 15.* 50 c.c. were precipitated, and the phosphomolybdate washed with alcohol until nitrate of silver solution proved the complete absence of chlorine; obtained 2.5625 grm. residue. Divided by 30.35 this indicates 0.0844  $P_2O_5$ . The residue dissolved in  $NH_3$  and the solution precipitated with Mg. mixture gave 0.1376  $Mg_2P_2O_7 = 0.0880 P_2O_5$ .

*Exp. 16.* 50 c.c. precipitated as above, with addition of 25 c.c. dilute  $HNO_3$ ; obtained 2.5283 grm. residue, or 0.0833  $P_2O_5$ . From this residue 0.1367  $Mg_2P_2O_7$  were obtained, containing 0.0874  $P_2O_5$ .

*Exp. 17.* 10 c.c. phosphate solution, 10 c.c. dilute  $HNO_3$  and 25 c.c. molybdic solution gave 0.5375 grm. residue, or 0.0177  $P_2O_5$ ; or from 50 c.c. 0.0885  $P_2O_5$ .

*Exp. 18.* 10 c.c. phosphate, 10 c.c. diluted  $HNO_3$ , 25 c.c. water and 25 c.c. molybdic solution gave 0.5378 residue, containing (divided by 30.35) 0.0177  $P_2O_5$  (or from 50 c.c. 0.0885  $P_2O_5$ )

Obtained therefore—

Taken.	$P_2O_5$ calculated from $Mg_2P_2O_7$ .	$P_2O_5$ in 50 c.c. calculated from Residue.
50 c.c. ...	0.0880	0.0844
50 c.c. ...	0.0874	0.0833
10 c.c. ...	—	0.0885
10 c.c. ...	—	0.0885

Two of these four determinations are therefore unsatisfactory, whilst two, those in which but 10 c.c. phosphate solution were employed, agree well with the phosphate of magnesia determinations. In further experiments I found a similar difference. On investigation I noticed that the residues obtained from smaller quantities are always perfectly soluble in water, showing that they really consisted of molybdate of ammonia and of phosphate of ammonia, whilst in cases where I employed a large quantity of phosphoric acid the residue was not entirely soluble in water, a separation of an insoluble molybdate of ammonia and loss of ammonia having taken place, although the solution during evaporation had been kept strongly ammoniacal.

I therefore abandoned the plan of weighing, what I may, for brevity's sake, call an ammoniacal residue, so liable to decomposition, and converted it, by repeated evaporation with small quantities of water to dryness, into what I will call an aqueous residue, incapable of losing by drying any further quantity of ammonia, and consisting of phosphate of ammonia and of an acid molybdate of ammonia. This kind of residue moreover has

the advantage of drying most rapidly to weight absolutely constant. I found that I had to divide the aqueous residue by 28.5 in order to obtain the amount of  $P_2O_5$  contained in it.

2.1932 grammes of a sample of superphosphate were dissolved and the solution made up to 250 c.c.

- Exp. 19.* 50 c.c. were precipitated and the precipitate after dissolving in  $NH_3$  converted into  $Mg_2P_2O_7$ , obtained 0.0908  $Mg_2P_2O_7$ , or 0.0581  $P_2O_5$ , or from 10 c.c. 0.0117  $P_2O_5$ .
- Exp. 20.* 10 c.c. were precipitated with 20 c.c.  $MoO_3$  solution, and the ammoniacal residue prepared. This amounted to 0.3532 grm., or 0.0116  $P_2O_5$ .
- Exp. 21.* 10 c.c. phosphate solution, 10 c.c.  $HNO_3$  and 30 c.c.  $MoO_3$  solution yielded 0.3519 grm. ammoniacal residue = 0.0116  $P_2O_5$ .
- Exp. 22.* 10 c.c. phosphate solution, 20 c.c.  $HNO_3$  and 40 c.c.  $MoO_3$  solution gave ammoniacal residue 0.3525 grm. = 0.0116  $P_2O_5$ .
- Exp. 23.* 10 c.c. precipitated with 25 c.c. molybdate; aqueous residue 0.3405, divided by 28.5 = 0.0119  $P_2O_5$ . It was dissolved in ammonia and the solution precipitated with magnesia mixture. 0.0183  $Mg_2P_2O_7$  resulted = 0.0117  $P_2O_5$ .
- Exp. 24.* Same quantities taken as before. Aqueous residue 0.3350 grm.  $\div 28.5$  = 0.0117  $P_2O_5$ . It yielded 0.0186 grm.  $Mg_2P_2O_7$  or 0.0119  $P_2O_5$ .
- Exp. 25.* Quantities as before. Aqueous residue 0.3347 = 0.0117  $P_2O_5$ . This gave 0.0184  $Mg_2P_2O_7$  or 0.0118  $P_2O_5$ .
- Exp. 26.* 10 c.c. phosphate solution, 50 c.c. water, 25 c.c. molybdic solution, yielded aqueous residue 0.3322, or 0.0116  $P_2O_5$ . This furnished 0.0179  $Mg_2P_2O_7$  or 0.0114  $P_2O_5$ .
- Exp. 27.* 10 c.c. phosphate, 10 c.c. dilute  $HNO_3$ , and 25 molybdic solution gave 0.3194 aqueous residue = 0.0112  $P_2O_5$ . From it 0.0177  $Mg_2P_2O_7$  or 0.0113  $P_2O_5$ .

Tabulated, these results are as follows:—

	$P_2O_5$ calculated from $Mg_2P_2O_7$ .			$P_2O_5$ from aqueous residue.		
10 c.c. phosphate ...	...	...	0.0117	...	...	—
„ ...	...	...	0.0117	...	...	0.0119
„ ...	...	...	0.0119	...	...	0.0115
„ ...	...	...	0.0118	...	...	0.0117
„ ...	...	...	0.0114	...	...	0.0116
„ ...	...	...	0.0113	...	...	0.0112
Average ...	...	...	0.0116	..	...	0.0116

Solution of another phosphorite, 2.5151 grms. per 250 c.c.

- Exp. 28.* 10 c.c. phosphate and 20 c.c. solution of another phosphate, 2.5151 grms. per 260 c.c. molybdic solution yielded 0.6308 grm. aqueous residue or 0.0221  $P_2O_5$ . Converted into phosphate of magnesia, it furnished 0.0335  $Mg_2P_2O_7$ , or 0.0214  $P_2O_5$ .
- Exp. 29.* 10 c.c. phosphate, 10 c.c. of a 20 per cent. nitrate of ammonia solution, and 20 c.c. molybdic solution yielded 0.6442 aqueous residue, equal to 0.0226  $P_2O_5$ , this furnished 0.0353  $Mg_2P_2O_7$  or 0.0226  $P_2O_5$ .
- Exp. 30.* Same as 29. Aqueous residue 0.6360 = 0.0223  $P_2O_5$ . From this 0.0349  $Mg_2P_2O_7$  equal to 0.0223  $P_2O_5$ .
- Exp. 31.* 10 c.c. precipitated with an excess of molybdic solution, the precipitate washed with 20 per cent.  $NH_4NO_3$ , and then dissolved in  $NH_3$  and straight converted into magnesia precipitate. Obtained 0.0346  $Mg_2P_2O_7$  = 0.0221  $P_2O_5$ .
- Exp. 32.* 10 c.c. phosphate, 20 c.c. molybdate. Residue 0.6197 equal to 0.0218  $P_2O_5$ . This furnished 0.0349  $Mg_2P_2O_7$  or 0.0222  $P_2O_5$ .
- Exp. 33.* 10 c.c. phosphate solution, 25 c.c. molybdate. Residue weighed 0.6452 grms. = 0.0226  $P_2O_5$ . From it  $Mg_2P_2O_7$  0.0361 grms. = 0.0231  $P_2O_5$ .
- Exp. 34.* 50 c.c. phosphate solution were precipitated with 125 molybdic solution, the precipitate washed with 20 per cent.  $NH_4NO_3$ , dissolved in  $NH_3$ , and the solution at once precipitate with magnesia mixture. Obtained 0.1707 grm.  $Mg_2P_2O_7$  containing 0.1092 grm.  $P_2O_5$ , or from 10 c.c. phosphate solution 0.0218 grm.  $P_2O_5$ .
- Exp. 35.* 50 c.c. were precipitated as above, the precipitate washed with alcohol (dilute). Obtained 3.1807 grm. aqueous residue, or 0.1116  $P_2O_5$ , or from 10 c.c. 0.0223. This residue dissolved in  $NH_3$  furnished 0.1719 grm.  $Mg_2P_2O_7$  or 0.1099  $P_2O_5$  from 10 c.c. therefore 0.0220  $P_2O_5$ .

*Exp. 36.* 1 c.c. of the phosphate solution were mixed with 10 c.c.  $\text{NH}_4 \text{NO}_3$ , and precipitated with 5 c.c.  $\text{MoO}_3$  solution. Aqueous residue 0.0692 or 0.0024  $\text{P}_2 \text{O}_5$  instead of 0.00223.

Thus the results are—

	$\text{P}_2 \text{O}_5$ calculated from $\text{Mg}^2 \text{P}^2 \text{O}_7$ .			$\text{P}_2 \text{O}_5$ calculated from aqueous residue.		
10 c.c. phosphate solution	...	0.0214	...	...	...	0.0221
" "	...	0.0226	...	...	...	0.0226
" "	...	0.0223	...	...	...	0.0223
" "	...	0.0221	...	...	...	—
" "	...	0.0222	...	...	...	0.0218
" "	...	0.0231	...	...	...	0.0226
" "	...	0.0218	...	...	...	—
" "	...	0.0220	...	...	...	0.0223
Average	...	0.0222	...	...	...	0.0223

These results are, I may safely say, highly satisfactory. They speak to the accuracy both of the magnesia method and of the molybdic method. The latter is, however, far less troublesome, requiring less labour, time and attention than the precipitation as phosphate of magnesia and ammonia. The precipitation does not take longer than two or three hours, and hence a determination of phosphoric acid can readily be completed within a day.

The expense of the molybdic acid is trifling, and it is a very simple matter to recover it from the solutions obtained on filtering the yellow precipitate and on dissolving the aqueous residue, after weighing. I prefer to work up the molybdic residue as follows:—I render the solution acid, if not already so, by means of nitric acid, add phosphate of soda, and heat; collect the precipitate, wash it superficially, dissolve in  $\text{NH}_3$  and precipitate the  $\text{P}_2 \text{O}_5$  by means of magnesia mixture. The filtrate is made slightly acid with nitric acid, when molybdic acid at once separates, is collected on a filter, washed and dried.

I will now refer, in a few words, to the method recently proposed by Finkener, alluded to above (Berl. Ber. 13, 1878). I became acquainted with it only after I had practically completed my investigation as detailed in this paper.

Finkener states that the yellow precipitate can readily be obtained of constant composition, *provided* there is always a sufficient quantity of free nitric acid, that at least one third of the total  $\text{MoO}_3$  taken remains in solution after precipitation of the phosphoric acid, and that 100 c.c. of the liquid contains no less than 25 grm.  $\text{NH}_4 \text{NO}_3$ . He washes with a 20 per cent. solution of  $\text{NH}_4 \text{NO}_3$  slightly acid with  $\text{HNO}_3$ , then with a little water removes the precipitate, partly by washing, partly by dissolving in ammonia with a porcelain basin, concentrates, adds  $\text{HNO}_3$ , evaporates and by careful heating drives off the nitrate of ammonia. The residue thus obtained contains 3.794 per cent.  $\text{P}_2 \text{O}_5$  ( $1 \text{ P}_2 \text{O}_5 = 26.36$  parts residue.)

To this is to be remarked that his precautions for obtaining a precipitate of constant composition are quite superfluous and clumsy. For although there is no doubt that nitrate of ammonia greatly increases the delicacy of the molybdic reaction, it evidently produces separation of molybdic acid or of a molybdate of ammonia. For according to Richters (Dingl. Polyt. Journ., Vol. 199, p. 183) the precipitates produced in liquids containing much  $\text{NH}_4 \text{NO}_3$  differ from those obtained under ordinary circumstances by their greater bulk and their lighter colour. Furthermore, on heating the residue to get rid of the nitrate of ammonia, reduction of the molybdic acid always takes place, and I obtained whenever I followed Finkener's instructions, a residue dissolving in  $\text{NH}_3$  with a dark blue colour, showing the presence of molybdic oxide.



## REVIEWS.

## PRACTICAL CHEMISTRY.\*

THIS is an extremely useful handbook, containing a large amount of carefully collected and well arranged information on the analysis of the principal articles of diet in daily use, and the detection and estimation of organic and inorganic poisons. The author has, of course, drawn largely from the published works of others, but he has followed, or we might almost say, set an example which might well be used more generally, by giving at the end of each chapter a list of the works consulted and from which the information has been partly drawn. By this means he affords a valuable opportunity for estimating the importance to be attached to those determinations or statements which appear to differ to any extent from those ordinarily accepted.

A very small amount of space is devoted to the ordinary laboratory manipulations, and this is certainly an advantage, for it is monotonous to read in handbook after handbook full instructions for carrying out processes which are supposed to have been learnt even by a junior student in a laboratory.

In the classification of the starches and directions for the microscopical examination, the author has followed closely the instructions laid down in Muter's *Organic Materia Medica*. The chapter on sugar is well and carefully written, and is one of the first cases in which we have seen the polariscopic estimation of sugar by the more recent optical method fully and accurately described.

In reference to wheat, bread and flour all the most recent researches are referred to, and the only thing we can see to regret is, that a method proposed by Wanklyn for the determination of gluten by means of alkaline and permanganate solution should have been referred to as a fairly accurate one, for, after all, such a process as this can only by any possibility yield a small percentage of the total nitrogen present.

As to milk and butter the author has availed himself freely of all recent papers that have been written on the subjects, and the chapters contain a very complete compendium of nearly all that is now known on the matter.

Tea, coffee and cocoa are treated very fully, and there are, perhaps, a larger number of original analyses than are to be found in any other book of the same class.

The chapters on alcohols, wines and beers are complete, and contain not only the necessary instructions for their ordinary analysis, but also the tables of original gravities; and in the case of wines, a reprint of Gautier's tables for the detection of the colouring matters which have been added.

The latter half of the book is devoted entirely to the detection and estimation of poisons, and a good deal of care has evidently been taken to arrange this matter in such a systematic and consecutive form that it should be handy for reference. We think the author has been very successful in his attempts in this direction, and all those who are occasionally troubled with difficult and tedious examinations for poisons will find the book of value.

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#### THE LOCAL GOVERNMENT BOARD REPORT.

THE seventh report recently issued devotes about five pages to the work done by public analysts under the Sale of Food Act, and these contain a good deal that is interesting to analysts generally. During the year ending March, 1878, to which the report refers, 27

\* *A Manual of Practical Chemistry. The Analysis of Foods and the Detection of Poisons.* By A. Wynter Blyth, M.R.C.S., F.C.S. C. Griffin & Co., 1879.

additional appointments of analysts were made, and up to that time the appointments then existing were as follows:—Counties, 42; boroughs, 72; district boards and vestries in the metropolis, 39; total, 153. The Board have recently addressed communications to all authorities who had not appointed analysts, and they note with satisfaction that many of those have since complied, or are complying, with the provisions of the Act. The Board point out as noteworthy that, “in several English counties, and in the greater part of Wales, no analyses whatever have been made, and the counties of Buckingham, Essex, Kent, Oxford and Suffolk have, together, only furnished 30 samples.” This is precisely the same information, and is conveyed in almost the same words that we used when we drew the attention of the public to the matter in the early part of 1877, and again in 1878, and the same remark will have to be made year after year until compliance with the Act is made compulsory. It is scarcely likely that a number of men interested in commerce—many of them in retail commerce—will, themselves, put a penal Act of this kind in motion. The tabulated statement of the description and number of samples analysed during the year is fairly concordant with that we have already published, allowing for the fact that there is three months difference between the dates of the commencement and close of the two tables. The remarkable fact again comes to the front that drugs are considerably more adulterated than the average of all other samples, and that, in fact, if we exclude spirits, the adulteration of drugs is 25 per cent. of that of all other samples taken together. This does not seem a very creditable state of things for chemists and druggists, and we can scarcely wonder that the opinion of the Board should be expressed in such terms as the following:—“We regret that a larger number of samples of drugs have not been submitted to analysis; it is obvious that the use of adulterated drugs may defeat the intentions of the physician, and that the consequences may be exceedingly serious. Of the samples examined, more than one-fifth are reported against, and some of them were far below the standard of the British Pharmacopœa. There was one case in which suspicion was aroused by the death of two dogs, to which medicine bought as jalap had been administered, and an analysis showed that two-thirds of the so-called jalap consisted of strychnine.” It is worth while to note that the number of samples of drugs examined, which the Board regret as insufficient, was larger than the number of samples of spirits other than gin, nearly as large as the number of samples of beer, and about 80 per cent. of the number of samples of flour, so that on the whole it appears that drugs were fairly looked into.

As to the dilution of spirits, the Board state they are aware that dissatisfaction has arisen as to the working of the Act, and that they have received petitions on the subject, but they sum up the matter by saying “it does not appear to us that any alteration of the law is necessary to meet this case; there is no reason why a publican should not sell a mixture of gin and water, provided that he does not sell the mixture as gin, *which it certainly is not.*”

The total number of samples included in the returns for the year is 14,706, of which 2,826, or 19.2 per cent. were adulterated.

The results of the examination of tea in bond show that out of 662 samples one chest was destroyed as unfit for food, 7 samples, representing 1,578 packages, were still under detention, and 36 samples, representing 10,491 packages, were allowed to be exported, *i.e.*, we presume they were considered too bad for consumption by civilized Englishmen, and so were sent out to the barbarians. Mr. J. B. Keene, the analyst concludes his report by saying that with one exception, the whole of the teas that were detained were from China, and the chief objection was the presence of exhausted leaves.

## CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

## CANE SUGAR IN MILK.

TO THE EDITOR OF "THE ANALYST."

SIR,—In the current number of THE ANALYST Mr. J. H. Collins has given an interesting account of a case of adulteration of milk with cane sugar. I ask him, in the interests of all public analysts, to publish full details of his methods of analysis, for I confess that I am puzzled by Mr. Collins' figures, and do not see how he has made out that the milk he speaks of was adulterated with 20 per cent. of a solution of cane sugar having the same specific gravity as ordinary milk.

A solution of cane sugar of the specific gravity of ordinary milk (*i.e.*, 1.030) contains 7.44 per cent. sugar (7.65 grammes in 100 c.c.). If a milk containing 3.2 per cent. fat, 9.3 per cent. solids not fat, and 12.5 per cent. total solids, were mixed with a solution of cane sugar of specific gravity 1.030, in the proportion of 80 gallons of milk to 20 gallons of the sugar solution, we should get the following figures, which I compare with Mr. Collins' milk.

	Sugared milk.	Mr. Collins' milk.
Fat ... ..	2.40 ... ..	3.00
Solids not fat ... ..	9.03 ... ..	9.37
Total solids ... ..	11.43 ... ..	12.37

Mr. Collins' figures lead to the following composition of the original milk, on the assumption that 80 gallons of milk were mixed with 20 gallons solution of cane sugar:—

Fat ... ..	3.75
Solids not fat ... ..	7.84
Total solids ... ..	11.59

It appears to me that the sophistication of milk with a solution of cane sugar presents considerable difficulties: the use of a solution of the density of milk would materially diminish the amount of total solids in the milk; whilst the use of a solution of sugar containing the same percentage of solids as milk would materially raise the specific gravity of this fluid. It is difficult to reconcile Mr. Collins' analysis with his conclusions. I also demur entirely to his statement that the whey of a milk sophisticated with syrup may be easily tested for cane sugar by dividing a measured quantity into two parts, inverting the sugar in one half by sulphuric acid, and titrating both with Fehling's solution. Fehling has stated (*Ann. Pharm.* 104, 79) that it is impossible to estimate milk sugar accurately by his solution without first converting the lactin into dextrose, and the widely discrepant statements published respecting the quantity of copper that a molecule of milk sugar reduces bear out this statement. Doubtless Mr. Collins has better evidence to advance than that already published of the sophistication of the milk in question, but he will serve the interests of public analysts by publishing that evidence.

Guy's Hospital, January 15th, 1879.

Yours, &c,

THOS. STEVENSON.

## ALUM IN FLOUR.

TO THE EDITOR OF "THE ANALYST."

SIR,—So much has been written about the detection of alum in flour, by the logwood test, that I feel somewhat reluctant to add to the bulk of matter. When I tried the value of the test for my own edification, I carried out some experiments, which at the time, I thought scarce worth recording. As the results throw some additional light upon the risk of failure in the use of the logwood test for alum in flour, and the reason of such failure is not exactly rendered apparent, I will ask space to make the following observations.

One would have thought that since the publication of the note, "On the Detection of Alum in Flour," by Mr. Carter Bell, in the *Analyst*,\* (which seems to be ignored by recent observers) no more would be heard of the fallacious character of the logwood test.

Under the impression that the baking of the bread rendered the alumina insoluble, and that this was necessary to ensure the success of the test, I took some flour purposely aluminised, and moistened it with baryta water, and, on adding an ammoniacal solution of logwood, obtained no indication of alum. I afterwards tried lime water, a solution of chloride of barium, and chloride of calcium with similar results but on mixing the aluminised flour with water (by mistake), and then adding baryta water, the logwood solution alone, or the ammoniacal solution produced the blue colour. I subsequently found that the addition of the chemical compounds enumerated did not interfere with the production of the blue colour, which was produced when the flour was moistened with water. The results obtained, were, however, not always the same, and I noticed that the stronger the alcoholic solution of logwood was, the more risk of failure, and when absolute alcohol was employed, even if the flour had been mixed into a stiff paste with water, no

\* Vol. 2, p. 28.

blue colour appeared. I found that this was due to the insolubility of alum in alcohol, hence the failure of the experiment. I then tried an aqueous solution of logwood, and noticed that it was infinitely preferable to the alcoholic solution for detecting alum in flour, and it has never failed to indicate the presence of alum throughout my experience. I take a *small* quantity of flour and rub it up well in a glass mortar with a *dilute* aqueous solution of logwood, to which a few drops of carbonate of ammonia solution have been added. The solution of logwood should only be slightly darker in colour than a saturated solution of bichromate of potash, and it should be added in sufficient quantity to convert the flour into a very thin paste.

I am, &amp;c.,

CARDIFF, *January 15th*, 1879.

J. W. THOMAS.

## TO THE EDITOR OF "THE ANALYST."

SIR,—The interest still felt respecting the question of alum in flour has, I observe, again brought the subject to the surface; and I take the opportunity of bringing to the notice of your readers a matter which may have some influence on the views of some persons, who look on the subject in a somewhat exaggerated way.

Twenty-five or twenty-six years ago the practice of adding alum to flour by the corn millers was very common, at least I may say it was so in this district. Several prosecutions were instituted in which I was professionally concerned. Under an old Act of Parliament, search, under a Magistrate's Warrant, can be made by a constable, and this authority was exercised in some of the cases I allude to. It was then discovered that those who practised this art, had special machinery for doing it, namely, a kind of mill fixed in the top part of the building, which ground the alum at a certain rate, and distributed it by means of spouts or conductors into the hopper or other receptacle of the wheat, and was ground with it by the stones. This method, I apprehend, is still pursued whenever the adulteration is practised by the miller. The idea that the alum could be distributed with sufficient regularity by the hand of a workman in a large mill is untenable. Another erroneous notion that appears to have taken possession of some minds, is that small doses of 3 or 4 grains of alum to a pound of flour would be of any use, or that it would be worth anybody's trouble putting such small quantities in. Judging from what now and then appears in print there is a deal to unlearn on this subject.

F. M. RIMMINGTON.

BRADFORD, *January 14th*, 1879.

## ANALYSTS' REPORTS.

The County Analyst (Mr. J. H. Collins) having reported to the Cornwall Epiphany Sessions that no samples had been submitted to him for analysis, owing to several recent cases being dismissed on technical grounds, the Chairman said the Court would have to take this matter into consideration. The magistrates who dismissed the cases in question only upheld, as they were bound to do, the decision of a superior Court. The recent decision of Lord Chief Justice Cockburn had virtually annulled the Act.

The public analyst for the County of Durham (Mr. A. J. M. Edger of Newcastle) reports that he has analysed 106 samples of food and drugs during the quarter ending December 31st, 1878, viz.:—67 of milk, 13 of butter, 3 of lard, 2 of oatmeal, 2 of cheese, 2 of flour, 3 of pepper, 1 of vinegar, 1 of sago, 7 of cream of tartar—and found 20 to be adulterated and 9 of inferior quality. The adulterated articles were—9 of milk, with amounts of added water varying from 5 to 33 per cent.; 2 of butter, one being composed entirely of fat other than butter, and 1 having an excessive quantity of water; 1 of lard, with 8.63 per cent. of water; 1 of oatmeal, with 15 per cent. of barley; 7 of cream of tartar, with sulphate of barytes, silica, bicarbonate of soda, and excessive quantities of tartrate of lime.

"PROOF SPIRIT."—"Proof Spirit" was so called because in the pre-scientific age it was customary to levy duty on spirits by a rough and ready process, called the proof, and conducted as follows:—A small heap of gunpowder was wetted with the spirit to be tested, and the wet spirit was then set alight. If the spirit was strong the gunpowder became ignited and flashed off very soon after the spirit was lighted; but if the spirit was weak, the water left behind it as it burned off wetted the gunpowder so that it did not explode. A careful investigation of the true constitution of the spirit showed that the weakest spirit capable of igniting the powder had the following composition by weight:—alcohol, 49.24; water, 50.76; specific gravity, 920. This is known as proof spirit.

THE SALE OF FOOD ACT.—At the Quarter Sessions held at Lancaster on the 30th December, the Chairman referred to the fact that in several cases of adulteration magistrates had declined to convict under the Food and Drugs' Act, on the ground that they did not consider the sale to a police superintendent was to the prejudice of the purchaser; and, after drawing attention to an opinion recently expressed by the Local Government Board upon the subject, said he had no doubt the Act would be set right in the next session, and in the meantime he hoped that magistrates would convict in all such cases proved before them for, if they did not, guilty persons would escape, and the public would be imposed upon. Mr. Fell alluded to the difficulties often experienced by magistrates in dealing with cases of selling adulterated spirits, and he proposed—"That in any Act which may be brought into Parliament in the next session to amend the Sale of Food and Drugs' Act, this Court is of opinion that the standard of spirits should be actually defined, and that a copy of this resolution be transmitted to the Secretary of State." Mr. Starkie, M.P., seconded, and the motion was carried.

## LAW REPORTS.

**ADULTERATED MILK.**—Thomas Robinson, dairyman, was summoned for selling adulterated milk. Mr. E. Bell defended. Mr. Supt. Marley stated that on the 21st December last he went to the Union Workhouse, where Mr. Robinson's serving-man supplied milk. Witness purchased a pint of milk from the man, the milk was quite warm when he obtained it, which was some time after it had been taken from the cow. The analyst's certificate was produced, and showed that the milk was adulterated by the addition of at least 8 per cent. of water. Mr. Bell stated that the milk in question was obtained by defendant from the Cleveland Dairy Company. The Chairman explained from what occurred previously, they were of opinion that the Cleveland Company respectably conducted their business. Mr. Bell, in asking the Bench to deal leniently with the defendant, said that he had had the contract for the Workhouse for the last twelve or thirteen years, and had never had the slightest fault found with him, and the milk complained of was not his own. The Bench, having regard to the position defendant occupied as a wholesale dealer, fined him 40s. and 8s. 6d. costs.

At Westminster, J. Foy, butterman and cheesemonger, of 30, Regency Street, Westminster, was summoned under 38 and 39 Vic., cap. 63, sec. 6, for selling an article not of the nature, substance, and quality demanded by the purchaser. Mr. Warrington Rogers prosecuted on behalf of the Westminster District Board of Works; Mr. St. John Wontner defended. Thomas Lightfoot, the inspector of the Board, deposed that on the 16th Dec. he purchased at the shop of the defendant half a pound of butter, paying 8d. for it. He told the woman who served him that it was for the purpose of analysis and offered her part of it. She then called his attention to a printed notice on the paper—"This compound is sold as imported, and declared according to the Act, section 8." He then asked if they had any "pure butter," and the woman said "No," but there was a placard in the window which set forth that "new grass butter was now on sale." He left the shop and submitted the sample for analysis. The analysis of Dr. Dupré, of Westminster Hospital, was then put in, and ran thus:—"Only slightly flavoured with butter, and consists almost entirely of fat other than butter fat, probably beef or mutton fat." It was not injurious to health. In answer to further questions, witness said that on the same day he purchased nine samples at the same price and seven of them were genuine. Mr. Wontner submitted that the defendant clearly came within the exemption of the 8th section, which enacted that no person should be guilty of any offence under the Act if at the time of the delivery of the article he should supply to the purchaser a notice, written or printed, to the effect that the article was a mixture. In this case the defendant had done so. The importation of butter into this country was very great, and some persons preferred a mixture to pure butter. The words of the section enacted that the giving of the label should protect the seller where the mixture was not injurious to health, or there was no intention to fraudulently increase the weight, bulk, or measure. He cited the case of "Pope, appellant, and Turle, respondent" (43 *Law Journal*, Common Pleas, Magistrates' case, p. 129), May 28, 1874. The justices of Bedford had dismissed a summons for selling adulterated mustard, and the complaining person asked for the opinion of the Court above. It was stated in the case that at the time the respondent delivered the mustard to the appellant he said "I do not sell you this as pure mustard," and at the same time called attention to the label on the cister, "Warranted free from injurious admixtures, but not sold as pure mustard." On analysis the mustard was found to be mixed with wheaten flour and tumeric. The justices were divided in opinion as to the words of the 3rd section of 35 and 36 Vic., cap. 74, "and who shall not declare such admixture to any purchaser thereof," one being of opinion that sufficient notice had been given, and the other that the seller should declare what the actual admixture was—*i.e.*, set out the component parts. That was the issue before Lord Coleridge, Mr. Justice Brett, and Mr. Justice Grove. They were undivided in their opinion that the seller was entitled to their judgment on the ground that he did declare to the purchaser that the mustard was mixed with some other ingredient, and, even had he not, he could not come within the 2nd section (which he must to incur the penalty), because if the admixture was such as to make it an adulterated article within the meaning of the 3rd section, still he did not sell it as an unadulterated article. He was not, therefore, within either section. The next case in support of his argument was not "reported," but appeared in *The Times* of June 8, 1875. This was also in the Common Pleas. ("*Gibson v. Leaper.*") It was a "case stated" by the Justices of Spalding, under 35 and 36 Vic., cap. 74, sections 2 and 3. Appellant was a grocer at Spalding, and sold a quarter of pound of Epps' cocoa without making any verbal statement as to its contents, but on the face of the packet were the words, "Prepared cocoa; for ingredients see the other side," and on the "other side" was a notification to the effect that it was necessary, to make the oil in the cocoa soluble and easy of digestion, to combine with it arrowroot and sugar, and such were the component parts of the packet. On analysis this was found to be substantially correct, but the Justices convicted the appellant. The Court quashed the conviction, holding that assuming the cocoa to be adulterated, it had not been sold as unadulterated. The mere handing of the packet did not constitute a complete sale, because it was open to the purchaser to reject it if it did not correspond with what he had asked for. Therefore, whether it was true or not that a mixture was necessary to make cocoa edible, this article could not be said to have been sold as "unadulterated." Now, in the present case, the inspector could have rejected the article if he thought fit. Mr. Wontner then,

having referred to the vexed question now pending in the superior Courts as to the "prejudice of the purchaser," Sir James Ingham having held that the inspector was not a *bona fide* "purchaser," contended that the word "compound" on this packet of butter was synonymous with "mixture," and signified something consisting of various ingredients necessary to make the whole. The inspector would certainly have been prejudiced had he got pure butter, for then he would have received an article he did not expect to get, for he went with the intention of not purchasing a genuine article. Then, again, this was an imported article and sold by the defendant as bought, so that it was not like a case where a man added to the bulk and adulterated it. The defendant had not the chance of proceeding against the person who sold it him, as the purchase had been made at an open market. Mr. Wontner contended, in fine, no offence had been committed under the Act, and the defendant was exempt under the 8th section. Mr. Woolrych, having recapitulated the facts and the heads of the defence, referred to the words, to the "prejudice of the purchaser." In his opinion, the objection was unfounded, and the inspector, purchasing an article under the provisions in section 13, was prejudiced within the meaning of section 6, to whatever purposes he may have intended to apply the article; that he obtained an inferior commodity, having paid the price of a genuine article; that the offence contemplated by the 6th section was complete on the delivery of the impure article to the purchaser, and that the prejudice described followed as a legal consequence. That appeared to him to result from the combined operations of the several sections referred to, and any other combination would defeat the provisions of the Act. He should act upon that opinion until, if erroneous, it should be corrected by the decision of a superior Court. With regard to the effect of the printed notice as a defence, he was of opinion, even assuming the notice to be, in point of form, in accordance with the section, the facts did not bring the case within the exception relied on. That only constituted a defence and exonerated the seller in the case of an article mixed with a matter or ingredient not intended fraudulently to increase its weight, bulk, or measure. The facts here, in his opinion, showed that the mixture was intended to produce the fraudulent increase described in the section. That being so, the notice would confer no protection, and it became therefore, unnecessary to inquire whether the notice was in point of form a good one, on which the question might be raised whether the term "compound" (a word used in other parts of the Act) was equivalent to the word "mixture," used in this section. He thought it became unnecessary to consider as to the notice not having been brought to the attention of the purchaser until after a complete sale and delivery, as required by the enactment; also that the facts of the case showed the fraudulent intent described; and the grounds on which he arrived at that conclusion were that the officer saw a printed notice that the "best grass butter" was served in the shop; that, paying the price of a genuine article, he was supplied with a commodity designated as butter, but having little or none of that article in its composition, and that for the same price he obtained genuine butter at other shops. On the whole of these facts, he considered the defence failed, and the defendant would be fined £3 and costs. Mr. Wontner asked for a "case," which Mr. Woolrych at once granted.—*Times*.

**SELLING ADULTERATED MILK.**—Hannah Dunnan, milk seller, was summoned under the Food and Drugs' Act for selling adulterated milk.—Superintendent Marley deposed that he went to defendant's house at Stranton and saw her supplying milk from a bowl. He asked defendant for a pint, which he received, and divided into three parts. The Certificate from Mr. Edger, County Analyst, was produced from which it appeared that the milk was adulterated by the addition of not less than 33 per cent. of water. Defendant denied selling "one sup" of the milk from which the samples were taken. Supt. Marley said this was untrue, as he obtained it in exactly the same manner, and from the same utensil as that from which the defendant was supplying her customers. Defendant also stated that she told the Superintendent that the milk he obtained for his sample was intended for a calf.—Supt. Marley stated this remark had reference to another can of milk. The Chairman, on behalf of the Bench, reminded the defendant that she had previously had several narrow escapes, having upset the cans of milk when the officers put in an appearance, but this did not influence their decision. The maximum penalty was £20, but they would this time only fine her £3 and costs.

John Brazell, dairyman, Lamb Street, was summoned for a similar offence. Supt. Marley gave evidence respecting the purchase of milk from a quantity with which customers were being supplied. The County Analyst's certificate showed that the milk was adulterated by the addition of not less than 17 per cent. of water. Defendant was not present, and the service of the summons having been proved, defendant was fined 40s. and costs.

John Reed, of Middleton was summoned for a like offence. The milk in this case was adulterated with at least 16 per cent. of added water. Defendant stated that he was supplied with the milk by Mr. Robinson, of California, and their agreement was that the milk should be pure. The Chairman stated that perhaps Mr. Robinson would compensate the defendant for the loss sustained owing to the impurity of the milk. Supt. Marley explained that a sample of Mr. Robinson's milk was still at the County analyst's, witness having obtained it as soon as he found the source from which defendant had his supply. Defendant was fined and costs, and the Chairman thought that defendant could have his remedy by process in the County Court.

George Hanley, grocer, Melbourne, was summoned for selling adulterated coffee, contrary to the Food and Drugs' Act. Mr. Supt. Wood purchased a quarter of a pound of coffee at the defendant's shop. He informed the defendant that it was to be analysed, and gave him proper notice. The analysis showed that there were 82 parts of pure coffee and 18 parts of chicory. The coffee was not labelled. The defendant alleged that he did not know that the coffee was adulterated. He sold it as he had bought it. He was fined 1s. and the costs. He was further summoned for selling adulterated mustard to Mr. Wood who bought a quarter of a pound from the defendant. The analysis showed that there was 87 per cent. of mustard, with 13 per cent. of wheat flour and a little turmeric. Fined 9s. and costs.—Thomas Nichols, grocer, Barmby Moor, was summoned for selling adulterated coffee. Mr. Wood bought a quarter of a pound of coffee, and told the defendant that it would be analysed. The analysis showed that the coffee contained two parts of coffee and one of chicory. The defendant stated that he had sold it as he had bought it. It was not sold to him as a mixture. Fine 1s. and costs—He was further summoned for selling to Mr. Wood a quarter of a pound of adulterated mustard. The analysis showed that there were 70 per cent. of mustard, 30 per cent. of wheat flour, some farina, and a little turmeric. Fine 1s. and costs. William Hoggard, grocer, Wilberfoss, was summoned for selling to Mr. Wood three ounces of sweet nitre which was adulterated. The analysis showed that there was 33 per cent. of water, and that it was practically of no use as a medicine. The defendant said he had sold it as he had purchased it. He was fined 1s. and costs.

**SWEET NITRE.**—George H. Myers, druggist and grocer, Welton, was charged at the Welton Petty Sessions, by Superintendent Ellerker with selling a certain drug, viz., sweet nitre, which was not of the substance and quality demanded. The Superintendent stated that he visited defendant's shop and purchased 3 oz. of sweet nitre. It was divided into three parts—one sent to the analyst, one detained by witness, and one by defendant, each being sealed. The report of the analyst was as under:—"The above should be 52 degrees over proof, whereas it is only 15.3, thus showing the presence of about 24 per cent. of water above the standard. It contains the proper per centage of nitrous ether, and it is not rendered useless as a medicine by being of great alcoholic strength. 17th Dec., 1878. Jas. Baynes."—Defendant said he was quite ignorant that the sweet nitre he sold was not of the proper quality. It was sold by him as purchased from a most respectable firm in Hull.—The Chairman (W. H. Broadley, M.P.) said so far as it was their duty they were determined to carry out the Act that the purchasers should have what they expected they were purchasing. Fine and costs £1 9s. 6d.

**ADULTERATED WHISKEY.**—A case was investigated at Bridgewater, lately, in which a publican was charged with selling adulterated whisky. The case was adjourned from the previous court, when Mr. Stoddart, the county analyst, certified that the sample was not that of ordinary whisky, but was entirely composed of plain raw green spirit, commonly called spirits of wine, lowered by thirty per cent. of water. For the defence another certificate was put in from Mr. Dugald Campbell, London, stating that the sample was genuine whisky. The case was adjourned in order that the samples might be analysed by the Crown officers at Somerset House.

**ADULTERATED MILK.**—Frederick R. Winn, a cowkeeper of Manor-street, Clapham, was summoned for selling milk mixed with water, to the prejudice of the purchaser, Mr. Smith. Mr. Corsellius, clerk of the Wandsworth Board of Works, who attended in support of the summons, produced the certificate of the analyst, stating that the milk was adulterated with 18 per cent. of water.—The inspector having proved the purchase of the milk from a boy in the street, the defendant said he sent out the milk in the same state as he received it.—Mr. Paget fined him 40s. with 12s. 6d. costs.

**THE NAME BUT NOT THE ARTICLE.**—Elizabeth Crawford, shop-keeper, Seaton Carew, was summoned for infringing the Food and Drugs Act.—Mr. Bell defended.—A pound of butter was purchased by the police-officer from defendant, and a sample forwarded to the county analyst, Mr. A. M. Edger, whose observations on the certificate were as follows.—"This does not contain a particle of butter. It is entirely composed of fats other than butter."—Mr. Bell admitted the offence, but stated that his client purchased it from a wholesale merchant, and had not the slightest knowledge as to its composition, otherwise she would not have sold it. Defendant had no guarantee from the merchant.—Defendant said that she purchased 36-lb. of the material as butter, at 1s. 2d. per pound, and produced her invoice.—The Bench considered that the invoice was a sufficient guarantee that the stuff was sold as butter by the merchant, and, therefore, dismissed the case against Mrs. Crawford; also ordering the remainder of the grease to be impounded.

The question of employing Mr. Comyns Leach as public analyst for the borough of Dorchester was discussed at the meeting of the Town Council on Tuesday last. It appeared that Mr. Leach offered to fulfil the duties for an annual salary of £10 and the 10s. 6d. fee for each analysis. Mr. George, of Dorchester, asked £20 a year and the fee. The Mayor and other members commented on the advantage of having a resident analyst, and were in favour of the appointment of Mr. George; but ultimately the matter was postponed. At Weymouth it is proposed to appoint Mr. Leach.

**A CURIOUS INFORMALITY.**—A Chester grocer, who was summoned for adulteration of coffee, got off on Saturday before the county magistrates through a curious informality. The county analyst reported,

"Sample adulterated with 20 per cent. of vegetable matter, which I believe to be chicory." The chairman (the Rev. R. Richardson) said it was nonsense for Mr. Carter Bell to say he could not tell if the added matter was chicory or not. The case must be dismissed.—*Liverpool Courier*.

**CHLOROPHYLLE.**—There have recently been many prosecutions under the provisions of the Sale of Food Act, for selling green peas coloured with copper, &c., it being alleged that the use of such colouring matter was decidedly injurious to the health of the consumer. Having this fact in view, M. Guillemare Professor of Chemistry, and M. Lecourt, manufacturer of conserves, at Paris, were struck with the advantage of substituting "chlorophylle" (a vegetable substance) for the colouring of green peas, &c. and we are pleased to say that their efforts in this direction have been quite successful. After many experiments these gentlemen have succeeded in definitely fixing "chlorophylle" on vegetables by adding it to that which they naturally possess, thus preserving the green colour which otherwise would be destroyed by ebullition—an operation which is necessary to insure preservation. Besides its simplicity this process presents the immense advantage of not introducing any injurious agent into the preserved vegetables, as the products employed enter into one's daily food. Consumers may thus place on the table, in the middle of winter, without fear of injury to health, or extra expense, vegetables admirable green and of excellent taste. The Académie de Sciences of Paris has reported most favourably on the process; and vegetables treated with Chlorophylle have been analysed by several English chemists with equally favourable results. Dr. Saunders, public analyst for the City, having examined samples, writes:—"The peas had a green colour and a good flavour. They were entirely free from copper or anything that would be injurious to the health of those using them as an article of food." We consider the new process of colouring preserved vegetables a very important one, a great improvement on anything brought out before and its success is exceedingly satisfactory.—*Grocer*.

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#### NOTES OF THE MONTH.

Our readers will feel much interest in the recent decision by Mr. Woolrych at Westminster, to the effect that a vaguely-worded printed slip, to the effect that "this compound is sold as imported and declared according to the Act, section 8," is not sufficient notice to the purchaser under that section. A case has been applied for, and we anxiously await a decision of the supreme court on the point. It is quite clear that the use of such formulæ lies in their effect of blinding the public to the true state of the case, and hence the value to the sellers. The Act intended that nothing should be sold in a mixed state, unless the ingredients of the mixture be clearly stated (as is done on the cocoa packets of all the great makers), and we hope that the court of appeal will see the thing in this light, and insist on *butterine* being sold as avowedly imitation butter prepared from animal fat. Nobody could then for a moment object to the article which, as now turned out, is wholesome, and even somewhat palatable.

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Once more that wretched analyst, who only lives to persecute honest men! What do you think he has been doing now? Actually he has had the audacity to report exactly according to the requirements of the Act, and so our dear friend the *Chemist and Druggist* once more deservedly shows him up. Why does he not give, in his quarterly reports, the results of convictions? What does it matter that he has no power to order, or responsibility in carrying out, prosecutions, seeing that it is his clear duty to break the requirements of the Act, and interfere with the province of the local authorities? Poor analyst, when can he ever do right? He is charged with initiating all proceedings, and when he distinctly shows that it is not his business, he is taunted with not reporting the result of the work of others. We despair of ever satisfying the *Chemist and Druggist*; to him an analyst, no matter how spotless, is but a red rag thrown before a bull, and he



goes the rag when he cannot get at the individual. After all what is it but the true spirit of the colliery districts, as exhibited in the famous dialogue;—"Who's that?"—"Stranger."—"Let's heave half a brick at him!" and so our friend goes on heaving his bricks, which luckily fall softly, and break on our backs. It amuses him, and it does not hurt us, so *vive la bagatelle!*

One is always meeting those who are complaining of the want of "harmony" among analytical chemists, but had they been at the annual dinner of our society, they would have found harmony reign supreme. Even grave and potent members of the "Institute" unbent themselves, and lent their songs and stories to keep up the jollity. One member was heard to exclaim, under the potent influence of "Heidsieck," that, "after all, there was more to be gained from F.I.Z. than from F.I.C—both were costly and purely luxuries, but the former was really the more satisfying." *In vino veritas.*

Mr. Comyns Leach has been appointed Public Analyst for the County of Dorset, and also for the Borough of Poole.

Dr. W. Morgan has been appointed Public Analyst for the County of Pembroke.

Mr. R. H. Ridout has been appointed Public Analyst for the Borough of Monmouth, *vice* E. H. Jones deceased.

### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price.
2130	S. Pitt ... ..	Manufacture of Carbonate of Soda ... ..	4d.
2182	F. Wirth ... ..	Manufacturing Phosphoric Acid and Super-Phosphate ...	4d.
2221	" ... ..	Manufacture of Phosphate of Potassa or Phosphate of soda ... ..	2d.
2519	" ... ..	Manufacture of Pyroxyline and Nitro-Cellulose ... ..	4d.
2203	E. W. Parnell, and J. Simpson ...	Manufacture of Caustic Alkalies ... ..	6d.
2211	H. H. Murdoch ... ..	Refining of Sugar... ..	4d.
2231	C. W. Heaton ... ..	Purifying Gas ... ..	6d.
2308	W. Hollman ... ..	Obtaining Vegetable Charcoal ... ..	2d.
2397	W. R. Lake ... ..	Carburetted Gas ... ..	2d.
2401	B. Dubos ... ..	Apparatus for producing Electric Light ... ..	2d.
2489	T. Redwood ... ..	Manufacture of Gas ... ..	4d.
3022	A. Allhusen ... ..	Manufacture of Soda ... ..	4d.

### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Boston Journal of Chemistry; The Dairyman; The American Dairyman; The Practitioner; American New Remedies.

# THE ANALYST.

MARCH, 1879.

## SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING was held at Burlington House, Piccadilly, on the 19th inst., the President, Dr. Muter, M.A., F.C.S., in the chair.

The minutes of the previous meeting were read and confirmed.

Mr. Adams and Mr. Hehner were appointed Scrutineers, and reported that Mr. Sidney Harvey, Public Analyst for Canterbury, Margate, &c., and Mr. Alfred Smetham, Analytical Chemist, Liverpool, had been elected members.

Professor F. A. H. La Rue, M.A., M.D., of Quebec, Canada, was proposed for election, and will be balloted for at the next meeting

The discussion on the papers on "Butter Analysis," read at the previous meeting, was then resumed by Dr. Dupré and Mr. Hehner, and concluded by Dr. Muter.

Mr. Hehner read a paper "On Condensed Milk," and a paper "On the Analysis of Coffee Leaves," in the discussion on which several members joined.

Mr. Wigner read a paper by Dr. Cameron, "On the Falsifications of Milk."

The next Meeting of the Society of Public Analysts will be held at Burlington House, on Wednesday, March 19th, at eight o'clock, and among the papers to be read will be one by Dr. Dupré "On Violet Powder."

## INFLUENCE OF THE DECOMPOSITION OF BUTTERS FROM AGE ON THE SPECIFIC GRAVITY OF THE FAT, AND THE PERCENTAGE OF SOLUBLE AND INSOLUBLE ACIDS.

By E. W. T. JONES, F.C.S.

*Read before the Society of Public Analysts on 15th January, 1879.*

IN January 1877 I made some analytical experiments on pure butters, the results being communicated to the Society of Public Analysts in March of that year, and afterwards published in THE ANALYST.\* The remaining portions, wrapped in paper, of nine samples, A to I inclusive (J was all used), were put into an open glass vessel, and left in a room connected with my laboratories until July last, when they were reached down for analysis, to show the effect of eighteen months' keeping, practically exposed to air and light; each one of the samples, as can be imagined, was thoroughly rancid, yea more, almost stinking. Some of each sample was carefully melted and filtered, to separate water, curd, &c., and the specific gravity of the fat and the soluble and insoluble acids taken in exactly the same way as when the first analyses were made. I append the results alongside those obtained when the butters were fresh.

Specific Gravity of the Fat at 100° F.	A		B		C	
	912.3	908.3	910.5	911.4	911.9	918.5
Soluble Acids ...	4.84	3.81	3.76	4.07	5.12	6.62
Insoluble Acids ...	89.00	90.13	90.44	89.69	88.86	87.09

\* Vol. II. p. 19.

	D		E		F	
Specific Gravity of the Fat at 100° F.	911.2	916.5	912.5	915.5	913.3	913.2
Soluble Acids ...	4.50	5.45	5.51	5.47	5.44	4.31
Insoluble Acids ...	89.80	87.41	88.64	87.20	88.11	88.66
	G		H		I	
Specific Gravity of the Fat at 100° F.	913.3	912.4	912.2	915.6	913.5	907.7
Soluble Acids ...	5.69	4.92	5.19	5.32	4.69	3.32
Insoluble Acids ...	88.32	88.29	88.79	86.81	89.46	90.35

It will be observed that in five samples out of the nine that the specific gravity and the percentage of soluble acids has increased, and the insoluble acids decreased; in one F, the specific gravity is nearly the same, but the soluble acids decreased, whilst in the remaining three, A, G, I, the specific gravity and the percentage of soluble acids have fallen, with, of course, an increase of insoluble acids.

These butters were all submitted to the same condition of keeping, hence the difference in degree and character of the changes must be due to the constitution of the butters themselves, and the varying amount of casein, water, salt, &c.

To the public analyst the most important point to notice is that the specific gravity test is seriously affected by the decomposition from keeping, whilst the amounts of soluble and insoluble acids have not been so much altered as to prevent a fairly reliable opinion as to genuineness.

Another matter of interest is the small amount of acidity, calculated as butyric acid, extractable by agitating a small portion of the *butter* (not filtered fat) with *hot* water. After removal of the fat the acidity was taken by decinormal soda. The percentages are upon the butter (not fat).

A	B	C	D	E	F	G	H	I
0.19	0.17	0.35	0.27	0.42	0.40	0.11	0.27	0.38

## NOTES ON THE ANALYSIS OF BUTTER.

By J. M. MILNE, Ph.D.

*Read before the Society of Public Analysts, on 15th January, 1879.*

HAVING lately had occasion to examine some samples of butter, and having made a number of experiments in connection therewith, it may not be out of place to bring the results obtained under the notice of the Society.

Though these notes contain nothing essentially new, still as the present process for butter analysis is of comparatively recent date, I think it is well that as many as possible of the results obtained by different analysts should be published; and, furthermore, there are one or two little modifications which I have found useful, and which may possibly be of advantage to others.

The process employed was the modification of Muter's original method, described by Jones, in THE ANALYST.\* The standard solutions we made as there directed; but latterly, instead of decinormal soda, as recommended by him, the semi-normal soda used for nitrogen determinations was employed, and found to give quite as accurate results, and, of course, obviating the necessity of multiplying standard solutions.

I can bear testimony to the ease with which the butter-fat can be saponified com-

*pletely*, on the top of an ordinary water oven, when the flask and its contents are pretty frequently shaken, and provided not much more than five grams of the fat are used for each experiment. As a means of preparing the fat for analysis, the method of simply melting the butter, allowing to subside for a short time, and then filtering, seems to leave nothing to be desired. That the fat *gains* in weight when kept melted for a length of time at 100° C, or when heated above that temperature, is, I think, indisputable. A weighed quantity of fat was placed in a small basin, in the water oven, with the following result :—

After 1 hour with frequent stirring, the whole weighed	...	30.1840	grams
„ half an hour longer	... ..	30.1832	„
„ 2 hours	... ..	30.1864	„
„ 1 hour at 110° C	... ..	30.1984	„
„ 1 „ rising to 116° C	... ..	30.2036	„

In determining the water in the original butter, a constant weight is possible to be obtained if a moderate quantity of the sample is placed in a very flat platinum basin, on an *open* water bath, and weighed at short intervals. When the basin and contents were kept in a *close* oven, it was found very difficult to obtain a constant weight. It has since occurred to me that it would be of great advantage to dry the fatty acids obtained in the analysis, on the *open* water bath also.

The trouble and difficulty experienced in weighing out approximately five grams of the butter fat, more or less, for saponification, may be reduced to a minimum, by the following simple expedient. The melted fat is run into a small stoppered Schuster's burette, and the tubulation having been carefully cleaned from adhering fat, the stopper is replaced, and the weight of the whole ascertained and noted. An experiment is first made in order to find approximately the number of drops of fat, which must be transferred from the particular burette used by the operator, into a tared vessel, in order to make up five grams, and this number is also noted. With the burette used in these experiments it was found that 280\* drops of butter-fat were required for five grains by weight. In practice it is only necessary to weigh the burette and contents (while fluid), loosen the stopper, and drop the required number of drops into the flask in which the fat is to be saponified. A drop or two may then be added in excess of this number in order to have the amount taken slightly *over* five grams, and the burette and contents are again weighed, to ascertain the *exact* weight of fat used. There are several advantages attached to this method of procedure. The fat remains longer fluid than in an open beaker. The wished for amount can be quickly obtained, and with ordinary care the neck of the saponifying flask is not soiled, and the fat has no tendency to run down the outside of the burette—an annoyance only too common when beakers, &c., are used—and even when a drop of fat does get outside the narrow orifice of the burette it very soon solidifies and remains stationary.

As regards the treatment and drying of the fatty acids, I have found the following very convenient :—After washing in the manner recommended by Jones, the cake of fatty acids is broken into small pieces. This is easily accomplished by a few taps on the flask, and there is then no difficulty in transferring the pieces to the filter. One or two judicious rinsings with cold water will then remove nearly every particle of fat from the flask, which is fixed in an inverted position over the filter, and the whole

\* The approximate number of drops will, of course, depend on the temperature of the fat at the time of weighing.

allowed to stand overnight. Next morning the flask is found to be quite dry, and a small quantity of ether will easily remove the traces of fat adhering to it. The fatty acids on the filter will be found to be pretty well air-dried, and can be readily removed to a tared flask, having a tolerably wide mouth. The rinsings of ether from the saponifying flask are then poured over the paper filter, and fresh ether poured over it till, on drying, no trace of fat can be seen. If the fatty acids have been carefully and completely removed from the paper, previous to washing, a comparatively small quantity of ether will suffice for that purpose. The flask can then be attached to a condenser, and the ether nearly all recovered by distillation on a water bath, and a few drops of absolute alcohol having been added to the flask containing the fat, the latter is further dried till constant in weight. As already stated, I think it would be more advantageous to dry the fat by placing the flask on an open water bath. The use of a flask such as I have mentioned, having a short wide neck, and with the weight marked on with a diamond, is, I think, preferable to that of basins or flat dishes. The ether used can nearly all be quickly recovered, and although, from a pecuniary point of view, this may be no great object, yet it avoids the risk of ether vapours floating about, and is a much more convenient method of getting rid of that agent. The fat does not rise up the sides of a flask, as it always does when flat dishes are employed, and the risk of a slight loss from this cause is avoided.

In order to test the process, a sample of fresh butter was procured from a farm near Greenock. This farm, it may be stated, is somewhat celebrated for the quality of the butter made there. On examination this sample gave the following results.

The sp. gr. of the dried and filtered fat was found to be 912.94 at 100° F. Analysis gave:—

					Average.
Soluble Fatty Acids	...	...	...	...	4.74 per cent.
Insoluble	„	...	...	...	89.37 „
Total	„	...	...	...	<u>94.11 per cent.</u>

A sample of beef fat was also obtained, the fat from which, when dried and filtered, had a sp. gr. of 902.1 at 100° F. Four different mixtures of beef and butter fats were made up in the following proportions:—

	No. 1	2	3	4
Butter Fat	52.38	24.69	96.94	99.00
Beef Fat	47.62	75.31	3.06	1.00

Analysis of these mixtures gave the following results:—

		No. 1	2	3	4
Soluble Acids	} Found	2.39	.95	4.50	4.67
	} Calculated	2.43	1.17	4.59	4.69
Insoluble Acids	found	93.37	94.94	90.76	89.64

A sample of butter sent to me for analysis, and which was afterwards admitted to be adulterated, gave the undernoted results:—

The sp. gr. of the dried fat was 906.1 at 100° F.

Soluble Acids (as butyric)	} 2.20	2.18 per cent.
	} 2.17	
Insoluble „	} 91.89	<u>92.03</u> „
	} 92.18	
		<u>94.21 per cent.</u>

Taking a standard of 5 per cent. soluble acids, and calculating to the original butter, gives :—

Butter Fat	...	...	...	..	38.32 per cent.
Foreign Fat	...	...	...	...	48.76 "

The above results corroborate what, I think, has already been pretty clearly established, viz., that a careful determination of the soluble "fatty acids" affords a very correct basis for judging of the amount of foreign fat present in any sample of adulterated butter; the addition of even 1 per cent. of beef fat showing an appreciable difference in their amount, and that, with ordinary care, the present method is capable of yielding very concordant results.

My best thanks are due to my friend Mr. Gossman, who kindly undertook the greater part of the work connected with these experiments.

In the discussion on the above two papers on Butter Analysis,

Dr. Dupré said that with regard to Mr. Jones' paper, it was unfortunate that he had published two analyses of some of the butters mentioned. In his first paper he found all his insoluble fatty acids very high. It was suggested by some of the members that he had not washed the fatty acids sufficiently, and therefore had left some of the soluble fatty acids in the insoluble. Mr. Jones, with great moral courage, came forward at the next meeting and said he had not believed it had been the case, but he had made some experiments and found it correct, and the difference in the results (which Dr. Dupré specified,) of course threw the whole of the table out and made it useless. The only thing useful was the sp. gr., which was not likely to have been affected, and as far as they went they corresponded very much with some observations of his own. He had found that some butters did not vary much in two years and a half, while others changed very rapidly. The changes which butter undergoes depended greatly upon the character of the original butter, and it was evidently impossible to say at any time what a butter might be a year hence. With regard to Dr. Milne's paper he could not see the use of once putting the fatty acids in a flask and then taking them out, but having once put them in never take them out, and then there was no chance of losing any drop, or of any other difficulties. He held, and held very strongly, every butter analyses to be worthless that gave the fat as much above 98 per cent., that is the fatty acids plus glycerine residue. Taking the average of the ten analyses given in his (Dr. Dupré's) paper on butter, they came to 97.99 per cent. of fat.—taking the equivalent of the insoluble fatty acids at 275, and the soluble fatty acids as butyric acid at 88. Taking the four butters Mr. Jones had re-analysed, the mean was 98.05, and taking the four acids according to his first paper—admittedly incorrect—the fat came to 98.75. In Dr. Milne's paper the fat comes to 99.28. Dr. Dupré had no hesitation in saying that no analysis with a high percentage of insoluble fatty acids should be accepted, unless it was accompanied by the statement of the percentage of soluble fatty acids.

Mr. Hehner pointed out that the fact that fat increased in weight when kept melted at 100°, was already known. He further remarked, that in most of Mr. Jones' analyses the difference between the insoluble acids on the first and second analysis was small. He found on comparison, that in the soluble acids three had risen and six had fallen—that was assuming the analyses to be correct. If the soluble fatty acids had fallen, then there was very great risk of confounding a genuine butter with an adulterated one. Looking at the insoluble fatty acids three had risen, and two of those very inconsiderably, quite

within the limits of error. Whilst it was possible that an adulterated butter might pass as genuine, he thought it was important that they should not condemn a genuine butter, but much rather let a bad one pass. In some cases the butters had changed considerably, in nearly all cases the fatty acids had gone in a right direction, and there was really no chance of confounding a genuine butter with an adulterated one. He thought Mr. Jones' figures were calculated to lead analysts into confusion.

The President having thanked the authors of the papers stated that he agreed with most of the remarks made by Dr. Dupré and Mr. Hehner upon them.

### ON CONDENSED MILK.

By OTTO HEHNER, F.C.S.

*Read before the Society of Public Analysts, on 19th February, 1879.*

OUR information as to the composition of the article known as condensed milk is somewhat contradictory. Thus Hassall gives four closely agreeing analyses, of which the following is the average:—

Water...	...	...	...	...	...	...	...	25.68
Casein	...	...	...	...	...	...	...	16.85
Milk sugar	...	...	...	...	...	...	...	15.36
Cane sugar	...	...	...	...	...	...	...	28.98
Fat	...	...	...	...	...	...	...	10.27
Mineral matter	...	...	...	...	...	...	...	2.80
								<u>99.93</u>

In consonance with these figures are those of Church. Wanklyn, on the contrary, states the contents as under:—

Water...	..	...	...	...	...	...	...	20.5
Fat	...	...	...	...	...	...	...	10.4
Casein	..	...	...	...	...	...	...	11.0
Ash	...	...	...	...	...	...	...	2.0
Cane and milk sugar...	...	...	...	...	...	...	...	<u>56.1</u>
								<u>100.0</u>

From the former of these analyses, assuming that the original milk contained 9.3 per cent. of solids not fat, I calculate that 3.76 parts of milk have been condensed into one part, and that the original milk contained 2.7 per cent. of fat, and 0.74 of ash.

Wanklyn does not give the milk sugar separately, but calculating this, from the average composition of milk, to be 12.6, a figure which certainly cannot be far wrong, we obtain as milk solids not fat, 25.6 per cent, or a condensation of 2.75:1, the original milk containing 3.8 per cent. of fat, and 0.72 per cent. of ash.

Condensed milk being now very largely consumed, not only as an addition to coffee, tea, etc., but principally as exclusive food for infants, it seemed to me a matter of some importance to ascertain which of these conflicting analyses was correct, and the exact proportion of condensation of the various brands of condensed milk now in the market.

I purchased at different shops what I suppose are average samples of condensed milk. The prices paid varied from 5d. to 7d. per one pound tin.

The analysis was conducted somewhat differently from the method usually employed, because it was found to be quite impossible to completely extract the fat from

the total solids by means of ether or benzoline, the large amount of cane sugar effectually protecting the fat. About 20 grms. were diluted with water so as to make 250 c.c., in 10 c.c. of this milk the total solids and the mineral matter were determined as customary; for casein and fat twice 25 c.c. were precipitated with a drop or two of acetic acid, and the coagulated casein, containing all the fat, collected on a weighed filter. In the one portion the casein and fat were weighed, from the other the fat was extracted by means of alcohol and ether, and the casein thus obtained. The milk sugar was determined gravimetrically by means of copper solution, and I adopted as basis of calculation the figures quite recently worked out by Rodewald and Tollens (Berl. Ber. XI., p. 2076), who, as the result of a most careful investigation, came to the conclusion that although the time of heating, the dilution of the solutions, and the proportion of excess of Fehling's solution employed, are all of some influence upon the proportion of cupric oxide reduced, yet in any case but a small error could be committed by fixing the reducing power of one molecule of milk sugar at 7.47 eq. of copper.

The cane sugar was generally deduced by difference, but in a few cases I determined it directly, and obtained as concordant results as could well be expected.

## I.—ANGLO SWISS CONDENSED MILK, PREPARED IN SWITZERLAND.

	1.	2.
Water ... ..	24.94	22.06
Milk sugar ... ..	13.29	12.85
Cane sugar ... ..	41.24	43.97
Fat ... ..	8.90	10.20
Casein ... ..	9.68	8.99
Ash ... ..	1.95	1.94
	100.00	100.00
Milk solids not fat ... ..	24.92	23.78
Condensation ... ..	2.67.1	2.56
Fat in original milk .. ..	3.3	4.0

## II.—ANGLO SWISS CONDENSED MILK, PREPARED IN ENGLAND.

	3.	4.
Water ... ..	25.63	24.99
Milk sugar ... ..	12.50	11.92
Cane sugar ... ..	41.21	40.23
Fat ... ..	6.13	10.88
Casein ... ..	12.65	10.02
Ash ... ..	1.88	1.96
	100.00	100.00
Milk solids not fat ... ..	27.03	23.90
Condensation ... ..	2.9	2.67
Fat in original milk ... ..	2.1	4.2

## III.—NORWEGIAN CONDENSED MILK.

	5.	6.
Water ... ..	28.85	29.05
Milk sugar ... ..	14.14	12.70
Cane sugar ... ..	36.74	38.14
Fat ... ..	9.21	9.66
Casein ... ..	8.98	8.58
Ash ... ..	2.08	1.87
	100.00	100.00
Milk solids not fat ... ..	25.20	22.52
Condensation ... ..	2.71	2.49
Fat in original milk... ..	3.4	3.9



From the tin containing sample 6 a quantity of gas escaped on opening, and soon a large proportion of the contents of the tin ran over in active fermentation.

## HELVETIA.

	7.	8.
Water ... ..	25·29	26·37
Milk sugar ... ..	13·01	13·21
Cane sugar ... ..	41·04	40·27
Fat ... ..	7·19	6·98
Casein ... ..	11·73	11·34
Ash ... ..	1·74	1·83
	<u>100·00</u>	<u>100·00</u>
Milk solids not fat ... ..	26·48	26·38
Condensation ... ..	2·85	2·80
Fat in original milk... ..	2·5	2·5

## GERBER &amp; CO'S CONDENSED MILK.

	9.	10.
Water ... ..	23·68	24·47
Milk sugar ... ..	12·93	12·23
Cane sugar ... ..	41·80	40·31
Fat ... ..	9·74	12·76
Casein ... ..	9·80	8·22
Ash ... ..	2·05	2·01
	<u>100·00</u>	<u>100·00</u>
Milk solids not fat ... ..	24·81	22·46
Condensation ... ..	2·6	2·41
Fat in original milk... ..	3·7	5·3

## "CREAM MILK," HOOKER'S PROCESS.

	11.	12.
Water ... ..	19·11	18·94
Milk Sugar ... ..	13·75	13·68
Cane Sugar ... ..	44·11	42·92
Fat ... ..	10·27	11·77
Casein ... ..	10·66	10·47
Ash ... ..	2·10	2·20
	<u>100·00</u>	<u>100·00</u>
Milk solids not fat ... ..	26·51	26·37
Condensation ... ..	2·85	2·83
Fat, in original milk ... ..	3·6	4·2

Both these samples were very lumpy, and contained large crystals of sugar.

## NESTLE'S SWISS MILK.

	13.
Water... ..	15·30
Milk Sugar ... ..	13·62
Cane Sugar ... ..	50·08
Fat ... ..	6·85
Casein... ..	9·98
Ash ... ..	2·17
	<u>100·00</u>
Milk Solids not fat ... ..	25·77
Condensation ... ..	2·76
Fat in Original Milk... ..	3·2

The amount of milk solids not fat varied, therefore, from 22·46 to 27·03 per cent., corresponding to a condensation of from 2·41 to 2·9 into one part; the fat fluctuated between 6·13 and 12·76 per cent., or in the original milk from 2·1 to 5·3 per cent., the cane sugar from 36·74 to 50·08 per cent., and the mineral matter from 1·74 to 2·20, average 1·98 per cent.

Only in one case was there a deficiency of fat, that is to say the original milk must have been skimmed; in two others it came just to the lowest limit of genuine milk, namely 2·5 per cent.

The average amount of condensation was 2·69:1, or, in order to get a milk containing the same amount of milk solids not fat as did the original milk, to one part *by weight* of the condensed milk, 1·69 parts by weight of water must be added.

I found the specific gravity of three of the above milks to be 1·283, 1·272 and 1·287, average 1·281.

Hence, as the average amount of milk solids not fat was 25·09 per cent., to one part *by volume* of condensed milk 2·45 parts by volume of water must be added to obtain a liquid with 9·3 per cent. of milk solids not fat. The amount of total solids (average on the manufactured article 76·26 per cent.) contained in the milk would then, on account of the very large amount of cane sugar, be 28·3 per cent.

If, however, we dilute the milk to 12 per cent. of total solids, then the casein, its most important constituent, is reduced to less than one half the proper quantity.

Now contrast with this calculation the directions given by the manufacturers. I lay no stress upon the proportions of water recommended to be added to make a milk suitable for culinary purposes, but take the directions laid down for the preparation of milk intended for infant's food, because we have a good standard, namely the composition of human milk, whereby to measure these artificial liquids, "For infants add 7 to 10 parts of water" (Anglo-Swiss made abroad), "add 7 to 14 parts of water" (Anglo-Swiss made in England), "7 to 10 parts of water" (Helvetia), "from 15 to 18 parts of water" (Norwegian).

Assuming that human milk contains one third less casein than cow's milk does, we ought to add, instead of the 2·45 volumes as given above, to one spoonful of condensed milk 3·6 of water, instead of from 7 to 18! If the dilution is actually made in the proportion of 1 to 18, then the liquid is hardly better than a very dilute solution of cane sugar, containing no more than 0·68 per cent. of casein, instead of upwards of 3 per cent. as contained in human milk. This wash would be a starving diet indeed.

In human milk the proportion of nitrogenous matter to saccharine matter (1 fat=2·4 sugar in effect) is as 1:4·3, in condensed milk as 1:7·7

Condensed milk, however excellent and valuable it may be in many cases as a substitute for fresh milk when the latter cannot be had, appears hence to be totally and absolutely unfit to be used as a substitute for mother's milk.

I have no doubt that both Hassall's and Church's analyses are correct. If so, condensed milk must of late years have materially deteriorated and become much thinner than it was when those gentlemen made their analyses.  $3\frac{3}{4}$  parts of milk were then condensed to one part; now only  $2\frac{3}{4}$  are evaporated to one, whilst the price has not, as far as I am aware, correspondingly decreased.

One tin of condensed milk, when *properly* diluted with water makes  $2\frac{3}{4}$  pints of fluid milk. Reckoning the price of one pint of fresh milk at twopence halfpenny,  $2\frac{3}{4}$  pints

would cost less than sevenpence, the price often charged for the condensed milk. Hence there is no advantage, on the score of economy, on the side of condensed milk.

There is another most objectionable statement made in connection with some of these milks. Both on the Anglo-Swiss and on the brand bearing the name 'Nestle' it is directed "add less water (than 1.5) and it is equivalent to cream." As cream itself ought to contain no less than from 25 to 30 per cent. of fat, it is evident that no amount of dilution could make condensed milk, with its 6 to 12 per cent. of fat, "equivalent to cream." I am not sure whether this declaration, from the side of the manufacturers, does not bring the brands in question under the scope of the Sale of Food and Drugs Act.

Through the kindness of Dr. Stevenson, of Guy's Hospital, I was enabled to examine a sample of Italian condensed milk. This article formed a pasty mass of the consistency of butter. It contained water 37.1 per cent., milk sugar 18.89 per cent., and mineral salts 3.07 per cent., from which incomplete data the condensation may be approximately calculated as 4.6:1. It does not appear to contain any cane sugar, or, if any, but a very small quantity.

From one of the samples of which I have detailed the analysis, I isolated the fat. This furnished 88.1 per cent. of insoluble fatty acids, and hence was genuine butter-fat.

Mr. Wigner said that in determining the milk-sugar by copper solution after coagulating with acetic acid and inverting, it was quite improbable that the results would have been within 5 per cent. of the truth. The difficulties of this determination were so great that it was rather by fortunate work than by the accuracy of the processes available and used that the totals cast up as these did. As to the sample of Italian milk, he might say that condensed milk made without sugar, could be obtained in London in almost any quantity. With regard to the ash being the most correct estimation in the whole analysis, and therefore the one from which the proportion of concentration could be most fairly checked, he thought that in doing that Mr. Hehner must have omitted to notice the fact that the class of sugar used for the purpose always contained a large amount of ash itself, often considerably in excess of that found in the milk, so that it would be impossible to take the ash as a reliable basis, unless an allowance were made for the salts present in the sugar. Again, if he took it correctly, the figures 2.76 of concentration were drawn from the solids not fat. During the concentration of milk with sugar, even in a vacuum pan, the casein underwent very rapid decomposition, and the consequence was that the nitrogenous matters in milk were very considerably altered during concentration. If a milk containing 3.5 casein were taken, and 40 parts were concentrated into 10 parts, instead of finding 14 parts casein, less than 10 would be found, as calculated from the ordinary nitrogen combustion. Mr. Wigner thought that whereas by Mr. Hehner's tables, 2.76 gallons, were being concentrated into one, the probability was that that 3.76 gallons were being concentrated into one. He would have much liked to have seen the analysis of the ash. The ash of sugar was largely alkaline carbonates. He did not know whether it had been mentioned, but the ash of milk contained almost 10 per cent. of its weight of chlorine.

After some remarks from Dr. Dupré and Mr. Hehner,

Dr. Muter said he agreed in condemning condensed milk as food, as he looked upon it as a most abominable thing for diet. If it were diluted sufficiently for an infant to digest it it was of no value as a food, and, if on the other hand, it were only diluted so that the casein should be as nutritive as in woman's milk, then an infant could not digest it. It was the cause of the death of many infants.

## ON THE FALSIFICATIONS OF MILK.

By CHARLES A. CAMERON, M.D., F.R.C.S.I., Professor of Chemistry, R.C.S.I.; Medical Officer of Health and Analyst for Dublin, &c.

*Read before the Society of Public Analysts, February 19th, 1879.*

A LONG list of alleged adulterants of milk is given in the books, some of which, there is every reason to believe, are purely apocryphal. In 1862 I was appointed public analyst for Dublin, and since that year the acts relating to adulteration have been put into operation in that city, and there have been convictions for selling adulterated milk and other articles every year since, and including, 1863. I was appointed analyst for other places in Ireland under the old act of 1860, repealed in 1872. I have therefore much experience as an analyst, especially at a time when there were no prosecutions of food adulterators in England, or, as a rule, in Ireland. During this latter mentioned period adulterators were not exposed to much danger of detection, and I believe their practices were conducted upon a very much larger scale than is the case at present, owing to the operations of the anti-adulteration Acts, even with all their imperfections of construction and administration. I mention these matters for the purpose of showing that I have had excellent opportunities of discovering all the adulterations of milk that have lately been practised in Ireland, and the following notes are a brief record of this experience:—

*Adulteration with Water.*—Water is, with but very rare exceptions, the only adulterant of milk used in Ireland. It is sometimes liberally employed. Many persons have been convicted in Dublin for having sold milk adulterated with from 50 to 120 per cent. of water—that is, to 100 parts of the pure milk, from 50 parts to 120 parts of water were added. In my certificates I state the amount of water added *to*, and not the amount of added water *in*, the milk. The most extreme case of adulteration with water which I have met with occurred some years ago at the workhouse, Mountmellick. The doctor noticed that an undue proportion of the children were suffering from rickets, and showing signs of under-nutrition. Acting on his suggestion, the guardians sent me three samples of the milk supplied by three different contractors: one I found to be a mixture of two parts of milk and one part of water, the second was composed of equal parts of milk and water, and the third consisted of two parts of water and one of milk—it contained only four parts of solid matter per 100 parts. One of the contractors who supplied this wretched stuff was a churchwarden of the parish!

The results of a large number of analyses of milk of undoubted purity have convinced me that the minimal standard of 9 per cent. of solid matters, minus fats, in milk is perfectly reliable. The adoption of this standard enables us to detect the addition of water to milk even when the total solids amount to more than 12 per cent. Some time ago I made an analysis of the mixed milk of a herd of Alderney cows owned by Colonel Forde, D.L., Seaforde, County of Down, and the following are the results obtained:

	100 parts contained:—			
Water	...	...	...	84·00
Fats	...	...	...	6·86
Cheesey matters and sugar	...	...	...	8·44
Ash	...	...	...	0·70
				100·00
	The milk therefore contained:—			
Solids <i>minus</i> fats	...	...	...	9·14
Fats	...	...	...	6·86
Total Solids	...	...	...	16·00

Here we have milk of exceedingly rich quality, and yet the solids, minus fats, did not exceed the proportion found in poor milk. The addition of even 6 per cent. of water to this rich milk could be detected. I may add, that this milk yielded 20 per cent. of cream, which I was informed was the usual proportion obtained in the dairy.

*Adulteration with Sugar.*—Only three cases of adulteration with sugar, and one with treacle, have come under my notice. In two of the former cases there were prosecutions by the Corporation of Dublin, but both unfortunately failed,—one owing to the death of the defendant before the case came on for trial; the other on account of a technical error made by the food inspector concerned in the case. In one of these cases the adulterants consisted of 90 per cent. of water and 1·5 per cent. of sugar; in the other 50 per cent. of water and 2½ per cent. of sugar.

*Adulteration with Common Salt.*—I cannot understand the object of adding salt to milk, but this substance is occasionally used for that purpose in Ireland. Last year the guardians of the North Dublin Union prosecuted a contractor who had supplied to them milk which I had certified was adulterated with 50 per cent. of water, and at least 0·5 per cent. of common salt.

*Adulteration with Chalk.*—It is a popular belief of great antiquity that chalk is a common adulterant of milk. On the other hand I am under the impression that public analysts doubt that such a sophistication ever existed. I have to record one, and the only, case that has come under my notice. A specimen of milk sent to me for examination by the guardians of Millstreet Union, county of Cork, was found to contain 1·11 per cent. of ash, of which one-half was insoluble in water, dissolved with effervescence in hydrochloric acid, and yielded lime equal to ½ per cent. of carbonate of calcium in the milk. The article was well watered, but the chalk had probably been added to rather stale milk to correct acidity, for the weather at the time was very hot.

*Adulteration with Flour.*—In Ireland this form of adulteration is excessively rare, as I have met with but one case of it. Last year I examined a specimen of milk for Mr. Lewis, the well-known perfume manufacturer, of Dublin, and found that it contained a very large amount of rice flour.

These are the only adulterants which I have found in milk. When the enormous number of samples which I have examined is considered, the cases of sophistication with articles other than water are extremely few and unimportant, numbering altogether only six, exclusive of salt, which is frequently added to milk. As these cases are authentic, and as similar forms of adulteration, except, perhaps, with salt and sugar, have not been noticed by the modern “public analysts,” it is worth while placing them on record.

*Milk deficient in Fats.*—The practise of selling milk which has been deprived by skimming of a portion of its cream is much more general in England than in Ireland; but a very common practice in the latter country is to sell as whole milk that portion which is first drawn from the cow, and is termed “foreings,” or fore milk. The fore milk is very poor in fat, which is the most valuable constituent of the article; whilst the portion of the milk last drawn (“strippings”) is extremely rich in fats, and, in fact, is sometimes like cream. The average amount of fats in whole milk is about 3½ per cent.; whilst in fore milk it sometimes sinks so low as 0·5 per cent. So common is the practise of selling fore milk for whole milk that when I find a milk to have less than 2½ per cent. of fats, I certify that it has been deprived of a portion of its cream by skimming, or that it is fore milk, which practically is the same thing. On this form of certificate there have been many convictions obtained. In August, 1877, a dairy proprietor was fined £10 for having sold fore milk as whole milk, by a Dublin police magistrate. He confessed to the practice in court, and added that he sold the strippings as cream!

## NOTES ON THE EFFECT OF LOW TEMPERATURES UPON MILK.

BY CHARLES ESTCOURT.

THIS subject possesses a practical interest, inasmuch as it is not of singular occurrence to find a defence set up, founded upon such effect. The usual theory has been that cold causes all the watery portion of the milk to separate out and rise to the surface, all the solids of milk being left at the bottom, if the milk be exposed for a sufficiently long period.

Of course the whole theory pre-supposes no agitation of the milk by carriage, or stirring up in process of sale.

Assuming these practically impossible conditions, I obtained the following results in experiments with two milks. One milk was exposed to so low a temperature in a cylindrical vessel, about  $2\frac{1}{2}$  deep by 3 diameter, that the top, the sides, and a portion of the bottom joining the sides, were solidified to the extent of about one inch in thickness, leaving a portion liquid, which occupied part of the middle and bottom of the vessel:—

	Milk at ordinary temperature.	Solid from top.	Solid from sides half way down.	Fluid from middle and bottom.
	Per centages.			
Total solids	12.06	15.00	7.0	18.9
Solids not fat	10.04	6.50	5.8	18.3
Fat	2.02	8.50	1.2	0.6

Another milk (which had been watered) was exposed to a temperature of about  $38^{\circ}$  F with the result that no portion of it solidified in about 12 hours.

	Milk at ordinary temperature.	Liquid from top.	Liquid from middle.	Liquid from bottom.
	Per centages.			
Total solids	11.56	14.00	10.20	9.64
Solids not fat	8.83	8.74	8.74	9.03
Fat	2.73	5.26	1.46	0.61

In the case with which I was concerned, the Inspector, being the first morning purchaser, was served with the top portion of the milk, and it was urged in defence that this sample *appeared* by analysis to have been fraudulently watered, when in fact the effect was produced by the low temperature to which the milk had been exposed.

The results of my experiments, however, disposed of this theory, for I think I may safely say no analyst would suspect watering in a milk represented by "top" in either sample.

## ON THE ESTIMATION OF ZINC IN SPRING WATERS.

BY E. HYLUS.\*

WHEN zinc must be estimated in potable waters, several litres should be evaporated in order to get weighable quantities of zinc. To save the trouble of evaporating the author uses the following method, with great success, in the absence of iron:—

2.6 grams of potassium ferrocyanide are dissolved in water, and then made up to 100 c.c.; 3.536 of zinc sulphate are dissolved in water, and made up to one litre. 1 c.c. of this solution, therefore, contains .01 of zinc oxide. Two glass cylinders, of about an inch and a half diameter, are filled, one with 200 c.c. of the filtered sample, the other

\* Correspondenz-blatt des Vereines, Analytischer Chemiker, Jahrg. 2, No. 3.

with 200 c.c. of springwater *free from zinc*. To each of them eight drops of hydrochloric acid and 2 c.c. of the ferrocyanide solution are next added. The ferrocyanide produces at once a cloud in the water containing the zinc. Zinc solution is now carefully added to the other, until the same turbidity is obtained. As the reaction takes some time to manifest itself, it is best not to add too much zinc at once, but to wait five minutes after every little addition of zinc solution. After this preliminary experiment, another 200 c.c. of the *sample* are put into a glass cylinder, with eight drops of HCl and 2 c.c. ferrocyanide. Five other cylinders are now filled each with 200 c.c. pure spring water, eight drops of HCl, and 2 c.c. ferrocyanide, and to the first one of these is added the same quantity of zinc solution as used in the preliminary experiment, to the

Second ...	...	...	...	...	...	·1 c.c. more.
Third ...	...	...	...	...	...	·2 c.c. —
Fourth ...	...	...	...	...	...	·1 c.c. less.
Fifth ...	...	...	...	...	...	·2 c.c. —

After standing for half-an-hour in not too strong daylight, the different turbidities are compared with the use of the *sample*. It is now very easy to calculate the amount of zinc.

The following three are selected from seven blank experiments, made by the author, to show the accuracy of his process, which, however, is no longer reliable, when the quantity of zinc exceeds ·05 gram per litre.

Taken ...	·02 gram ZnO	Found ...	·022
„ ...	·01 „	„ ...	·012
„ ...	·002 „	„ ...	·002

The presence of minute quantities of zinc does not seem so injurious to health as is generally believed. The author analysed a sample of springwater from Tuttendorf, in Germany, and found it to contain ·007 gram of ZnO per litre (·49 grns. per gallon), and he was assured that this water had been drunk by the population for about a century.

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## NOTE ON THE FILTER WASHING OF THE FATTY ACIDS.

BY J. BRIERLEY.

THE fatty acids may be washed without any fear of loss from running through or over the filter, by simply using a double filter in the following manner:—

Take two filter papers of different sizes, fold them separately, and place the small paper inside the large one, with its triple fold towards the single part of the large paper.

If the papers used be of the same size, the fat is very often carried over the edge by the capillary attraction between the folds of the paper.

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## CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

### CANE SUGAR IN MILK.

TO THE EDITOR OF "THE ANALYST."

SIR,—In reply to Dr. Stevenson, I have much pleasure in giving details of my analysis of the sugared milk referred to in my letter of December, 1878 (*Analyst*, January, 1879).

The milk, which had a sp. gr. of 10·30, was first analysed in the ordinary way by Wanklyn's method, when the somewhat contradictory results induced me to make a second analysis—the results of which were quite concordant with those of the first.

	1st.	2nd.
Fat ... ..	2·94	3·10
Solids not fat .. ..	9·42	9·37
Ash ... ..	·57	·58

In both these the fat and solids not fat were rather low, but not sufficiently so to lead me to condemn the milk, but the low ash induced me to investigate the matter further.

Noticing that the milk was unusually sweet, I at first suspected glycerine, but not being able to detect any, I then thought of cane sugar, and it at once occurred to me that I might be able to ascertain whether it was present by taking a measured quantity—inverting one half by  $H_2SO_4$ , and titrating both with Fehling. This I did, and the result indicated 3·1 per cent. of cane sugar in the milk.

In another portion I determined the casein, and found 2·9 per cent. Then  $9·37 - (2·9 + 3·1) = 2·8$ , the amount of lactose indicated by difference. No doubt this method gives *too high* a proportion of cane sugar, and I never pretended to determine it “accurately” by this method alone. Had I relied upon this exclusively, I should have said the milk had been adulterated with more than 30 per cent. of sugared water instead of “at least 20” per cent. I still, however, assert that “the whey of a milk sophisticated with syrup may be easily tested for cane sugar” in the way specified, as the difference will always be much greater than in the case of a whey unadulterated with cane sugar. If Dr. Stevenson, or any one else, can point out a better mode of detecting this ingenious (and I think often practised) sophistication, no one will be better pleased than myself.

Yours, &c.,

57, Lemon Street, Truro, February 8th, 1879.

J. H. COLLINS.

### ANALYSTS' REPORTS.

At the quarterly meeting of the Bristol Town Council, on Tuesday, Mr. Stoddart, City Analyst, presented his report, which stated that during the past quarter he had made sixty-one analyses of food, &c., and found that ten were more or less impure or unadulterated. Of the articles analysed, fifty-four were brought by the inspector and seven by the public themselves.

At the Marylebone Vestry, Dr. Whitmore reported that during the quarter ending January 31, he had analysed forty-five samples of food consisting of 16 samples of milk, 8 of mustard, 9 of butter, 6 of coffee, 3 of bread, 1 of whisky, and 2 of gin. All the samples of milk, with one exception, were genuine. Three samples of mustard were adulterated with starch to the extent of from 25 to 30 per cent. All the samples of butter were so far genuine as to be free from adulteration of any fat other than butter, but it is important to notice that in several samples the water, salt, and organic matter (not fat) amounted to 16 or 18 per cent. of the whole. The samples of coffee were all genuine, as were also the samples of bread. The samples of whisky and gin were somewhat below the standard of strength at which they are usually sold; in other respects they were free from adulteration.

### LAW REPORTS.

**MILK OF SULPHUR CASES.**—Mr. J. W. Bentley, grocer, High-street, Guildford, appeared to an adjourned summons charging him with having sold on the 1st of January last two ounces of sulphur not of the nature, substance, and quality demanded by the purchaser. The case had been adjourned, as were several others of the same kind, for the attendance of the borough analyst. The Town Clerk again appeared for the prosecution, and Mr. George White for the defendant. Evidence as to the purchase of the article by P. S. Tittley having already been given, Mr. Angell, public analyst for the Borough, stated that he received from Mr. Superintendent Law the sample of “milk of sulphur” marked No. 59. He analysed the same, and found it was not “milk of sulphur” but “sublimed sulphur,” or “flour of sulphur,” the elementary constituents of which were the same as in “milk of sulphur,” but prepared in a different way, and intended for a different purpose. The “flour of sulphur” was a much cheaper article than “milk of sulphur,” which was made from “sublimed sulphur,” with other ingredients added. If purchased by the cask “sublimed sulphur” would run about 16s. 6d. per cwt., while precipitated or milk of sulphur would cost 38s., and even that would not be a pure article. There was no lime in the sample, and the article was not a medicinal preparation. Any grocer upon being asked for the medicinal preparation of sulphur should refer the intending purchaser to a druggist. He believed there was a law which prohibited grocers from selling drugs. Cross-examined—He regarded himself as the representative of the interests of the



"Food and Drugs Act" in that borough. He suggested that the grocers as well as the chemists of the town should be called upon and asked for the "milk of sulphur." He could not positively say that he had the man sent round for the articles. Mr. D. Haydon, a magistrate—Mr. Angell would only be doing his duty in directing such steps to be taken. Cross-examination continued—There was neither lime, sulphate of lime, nor gypsum in pure "milk of sulphur." He was not aware that the term "milk of sulphur" was eliminated from the "British Pharmacopœia" in the last edition of 1867, which he had referred to. He knew that in the Runcorn case there was 58 per cent. of sulphate of lime in the sample of "milk of sulphur." Re-examined—He was satisfied that "milk of sulphur" and "precipitated sulphur" were synonymous terms. Mr. White, in addressing the Court for the defence, said that from the beginning it had been all a mistake, though originated by Mr. Angell in his desire no doubt to gain a reputation in the Borough. In the work which that gentleman had himself referred to as an authority for the case, the term "milk of sulphur" was not used, and it was clear that he should have given instructions for the purchaser to ask for "precipitated sulphur," and not that which was demanded. The term "milk of sulphur" might have remained in use amongst the people, but it was not in the "Pharmacopœia," and he was informed that "precipitated sulphur" was quite a different article, which was doubtless the reason of the omission to which he had drawn attention. He held that Mr. Angell should have got the purchaser to ask either for "sublimed sulphur" or "precipitated sulphur," and then probably the mistake would not have occurred. As it was, Sergeant Titley asked for an article which the trade had ceased to manufacture, and the nearest kind to it in the shop was supplied. The Bench surely would not convict the defendant of an offence, when the purchaser had simply misled him, and had gone for the sulphur to a grocer, who only sold the common kind. It had been contended by Mr. Angell that "milk of sulphur" and "precipitated sulphur" were synonymous terms, but others held differently, and it was manifest that by using one term when another was meant, all the tradesmen in the town might be taken in. Henry Williams said he was an assistant to Mr. Bentley. He remembered Sergeant Titley asking to be served with some sulphur. He understood him to mean the "powdered sulphur," which was, he believed, purer than the ordinary sulphur. He supplied him with two ounces for a penny, and was then told it was wanted for analytical purposes. Cross-examined. He did say that the powdered sulphur was purer than "milk of sulphur," as that was more adulterated. He did not tell the purchaser they did not sell "milk of sulphur," as he did not know there was any difference. He thought that the purest kind would be sure to do. He did consider he was selling a purer article than that which was asked for. He had seen "milk of sulphur," but not at Mr. Bentley's shop. He did ask another young man in the shop about the "milk of sulphur" at the time, and he said it was the same as what they had got. Mr. Sells, a magistrate: Then one was as ignorant as the other. There is as much difference between the two as between "Malaga" raisins and "Valentia" raisins. It seemed that in the matter of selling drugs they were going back 100 years. The defendant being asked from the Bench if he knew the difference between the two sulphurs, replied in the negative. There being no further evidence, the Mayor said they would reserve their decision until they had heard the other cases.

Mr. Frederick Wheeler, was also summoned for a similar offence. The Town Clerk observed that the distinction in this case from the others heard was that the defendant was a chemist and might reasonably be expected to know more about sulphur and other drugs, than the grocers, and he had further charged 2½d. for a precisely similar article to that which Mr. Bentley charged only one penny for. Police Sergeant Titley said that he went to the defendant's shop on the 1st January, and asked for two ounces of "milk of sulphur," which defendant himself supplied and charged 2½d. for, and which he paid him. He told the defendant the article was wanted for the purpose of being analysed by the Borough Analyst, and that he could retain a portion of it if he liked, which he declined doing. Witness thereupon gave the packet to Mr. Superintendent Law. Mr. Angell stated that he received the sample No. 60 from Mr. Law, and upon analysing it, he found, as entered in his book (produced), that the sample consisted of "sublimed" or "flour of sulphur," which was an article of inferior value to "milk of sulphur," and of different preparation. By the Defendant: The article bought was pure "sublimed" sulphur. It was a different preparation to precipitated sulphur. The defendant said he gave the purchaser what he considered a pure "milk of sulphur." By Mr. Sells: I keep "milk of sulphur," and had some in my shop at the time. The ex-Mayor: Then why did you not supply it, as it was asked for? The Defendant: Because I should then have been prosecuted, according to Mr. Angell, for selling sulphur which contained lime, which the analyst states to be illegal. Mr. Sells: Then knowing the difference between "milk of sulphur" and "flour of sulphur," you purposely supplied the inferior article when asked for the other. Mr. Angell, in answer to Mr. Sells, said he did not find any arsenic in the sulphur which he analysed. He was certainly surprised at the mistake which had been made in serving the wrong articles, but he did not ask any questions as to how they had been made.

Mr. E. Waller Martin, chemist, High Street, was summoned for the like offence. The Town Clerk said the distinction in this case from the others was, that the article sold was "Milk of sulphur," but contained 7·8 per cent. of sulphate of lime. Sergeant Titley stated that he visited the defendant's shop on

the 2nd of January, and asked to be supplied with two ounces of "milk of sulphur," and was served by a shopman, who charged 3d. for the article, which he paid. He told him that the sulphur was bought to be analysed, and that he could keep a portion if he thought proper; he declined the offer, and witness handed the packet to Mr. Superintendent Law. Mr. Angell stated that upon analysing the sample No. 62 he found it to contain 7·8 per cent. of sulphate of lime, and the rest sulphur. "Milk of sulphur" certainly ought not to contain any lime. He repeated that "Milk of sulphur" and "precipitated sulphur" were synonymous terms. By the defendant: His authorities for saying they were the same thing were "Dr. Attfield's Manual of Chemistry" and works by Dr. Prior, Dr. Muter, and Ure's "Dictionary of Arts." (The witness read extracts from the works of the authors named, and observed that he knew of no higher authority than that of Dr. Attfield, who was Professor of Chemistry to the Pharmaceutical Society of Great Britain). He did place the authorities he had quoted collectively before the Pharmacopœia of 1867. Mr. Sells said he had medical authorities dating back to 1745, showing lime to be recognised as a component part of "milk of sulphur." Mr. Angell observed that that was before the use of hydrochloric acid was known. Mr. Sells said it was so recognised down to a very recent period, and he asked Mr. Angell if he was not aware that it was a fact that the older medical men in the present day preferred the old preparation of sulphur with a small quantity of lime in it? Mr. Angell answered that he was not aware such was the fact. Mr. Sells said he was old-fashioned enough as a medical man, and he preferred the old preparation, and he read an extract from the writings of an eminent surgeon of Liverpool, who held the like view. Mr. Angell in answer to Mr. Sells, said there was nothing to prevent the preparation being made in that way still; and that any person supplying "precipitated sulphur" when asked for "milk of sulphur" would not be substituting an inferior article, but in supplying "sublimed sulphur" they would be giving an inferior article to "milk of sulphur." Mr. D. Haydon asked what standard the chemists had to go by? Mr. Angell replied, the latest edition of the "Pharmacopœia." Mr. Haydon: Then must the magistrates regard the article as obsolete, or go back to a previous edition? Mr. Angell said the terms were bracketted now. Mr. Martin: Not in the addition we have here. Mr. Angell said he would admit that, but it was so in other works, the term "milk of sulphur" having no meaning, there being no milk in it, had been properly left out of the 1867 edition of the "Pharmacopœia." By Mr. Sells: With 7·8 of lime only in the article, there was no danger in it, but cases might occur, and indeed had occurred, where the proportion of lime had been from 70 to 80 per cent., which was a dangerous proportion. Mr. Martin said his case was simply that he as a chemist was bound to go by the "Pharmacopœia" of 1867, and he relied upon the decision in the Runcorn case, which was precisely similar to his own. He produced a report of the decision given in that case by the justices in Quarter Sessions, held at Knutsford in April 1877, Sir Hardinge Gifford, M.P., the Solicitor-general being one of the magistrates present, when the conviction of a chemist for selling milk of sulphur was quashed, it being held that in selling the article he had committed no offence within the meaning of the Act. He maintained that it was pure "milk of sulphur" that the witness Titley was supplied with, and that he had committed no offence within the meaning of the Act. The Bench then retired, and after a short deliberation, the Mayor announced that they had given the cases serious consideration, and as a result they found that in Mr. Martin's case the article was sold as was demanded by the purchaser, and the charge would therefore be dismissed; in the case against Mr. Bentley, the Bench considered he had acted wrongly, but he had charged a fair price for the article sold, and believing that a mistake only had been committed, they felt that justice would be met in the nominal fine of a farthing; in the case of Mr. Wheeler, it was admitted that quite a different article had been knowingly supplied by the defendant to what was demanded, and a fine of 20s. and costs would be inflicted.

**ADULTERATION OF MILK.**—At the Alton Petty Sessions, Edward Faithful, milkman, in the employ of Mr. W. G. Gunner, was charged with selling milk which had been adulterated with water. The charge was denied. The case was heard at the previous bench, but the magistrates, at the request of Mr. Gunner, postponed their decision till the milk had been analysed at the laboratory at Somerset House, defendant being dissatisfied with the county analyst's report, which was as follows:—

"I am of opinion that the sample of milk contained the parts as under, or the percentages of foreign ingredients as under:—Butter fat, 2·94 per cent.; solids not fat, 8·30; genuine milk, 89 parts; added water, 11 parts. Taking the lowest quality of genuine milk as a basis for calculation, there are at least 11 per centages of added water in this sample. If the original milk was of fair average quality much more must have been added. No change had taken place in the sample. Mr. Arthur Angell, the analyst, was examined as a witness, his evidence being to the following effect:—Water was a large component part of milk, but he was perfectly confident he could detect any excess, though there was no natural distinction between added water and that which formed a component part of the milk. The amount of fatty matter in the solids make the difference between rich and poor milk. The quantity of water in genuine milk is subject to but slight variation. According to the standard which has been fixed by the Society of Public Analysts 9 per cent. is the lowest quantity of "solids not fat," found in genuine milk. He was not certain whether keeping milk would add to the proportion of water which it contained. Decomposition might

alter the relative proportions of liquid and solid matter. He believed he analysed the milk shortly after he received it. The feeding of cows would materially affect their milk as regards the fat it contained, but as long as the animals were healthy the quantity of the dry solids contained in the milk would be practically constant. He did not take the specific gravity of the milk. He was not of opinion that the fact of cows eating frosted sweeds would increase the proportion of water. The defendant, Edward Faithful, deposed that he milked the cows on the 12th of December, and afterwards sold the milk in the town. He swore that he added no water to it. The milk was out of his sight for about three-quarters of an hour in the shed, with the door shut but not locked, and someone might therefore have put water into it without his knowledge. He did not think there was any water in the can when he put the milk in. The Somerset House analysis was as follows:—The sample of milk referred to in the annexed letter was duly received on the 9th instant. We hereby certify that we have analysed the same, and declare the result of our analysis to be as follows:—Solids not fat, 7.54 per cent; fat, 3.57; water, 88.89. After making the addition for natural loss arising from the decomposition of the milk through keeping, the amount of "solids not fat," is lower than is found in genuine milk of low quality. From a consideration of these results we are of opinion that the milk contains not less than five per cent. of added water." The magistrates imposed a penalty of £5, fine and costs. The money was paid.

ADULTERATED WHISKEY.—At the adjourned hearing, at Bridgewater County Petty Sessions, of the case referred to in our last number in which a publican was summoned for selling adulterated whiskey, a certificate was produced, obtained by the defendant's solicitor from the laboratory at Somerset-house, contradicting, on material points, one from the county analyst, produced at a former court by the police. It was alleged in the latter certificate that the sample was entirely composed of plain raw grain spirit, lowered by the addition of about 30 per cent. of water, and coloured with burnt sugar. The Somerset house certificate stated that the sample of what was admitted to be the same spirit was a mixture of malt and raw grain spirit, of which Irish whiskey was generally constituted, and that it was free from impurities. The summons was dismissed.

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#### NOTES OF THE MONTH.

According to the report of a recent trial at Guildford, the analyst is credited with stating that "he regarded himself as the representative of the interests of the Sale of Food and Drugs Act in that borough. He suggested that the grocers as well as the chemists of the town should be called upon and asked for milk of sulphur." Naturally our able opponent the *Chemist and Druggist* takes gleeful hold of this statement, and not only that organ but also the great apostle himself opens the vials of his wrath upon analysts generally. The former suggests that we should "be good enough to read the report of the Guildford case," and the latter, first quoting the regret expressed by our late President that our members were often wrongfully abused as public prosecutors, triumphantly points to the present instance as proving that the abuse is deserved. We would, however, beg to remind these authorities that exceptions are often necessary to prove the rule, and if one member of our Society so far forgets his position as to usurp the functions of the inspector, it does not follow that we are all equally oblivious to our proper stations. We regret much to have to disagree with any member of the Society, but in the present case we must hold that the analyst overstepped his province. He should remember the famous words of the French general, "above all, sir, *pas de zèle*."

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It would also, we submit, have been wiser for the analyst to have accompanied his certificate with a letter to the inspector, calling his attention to the decisions already given, *re* milk of sulphur, and then if the proceedings were taken, the blame (if any) would have been entirely removed from his door. The very object of giving reports

in THE ANALYST of all the leading cases is to keep our members *au courant* with such decisions, so that when a case of the same kind occurs to them they can warn the inspectors by showing them the former decisions on the point.

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What is "raw grain" whiskey? According to Mr. Stoddart he had a sample of so-called Irish whiskey, which was "simply raw grain spirit diluted with water and coloured by burnt sugar." According to Somerset House it was genuine Irish whiskey, "a spirit made from mixed malt and raw grain." Is ordinary German spirit of wine (made from any cheap farinaceous matter by conversion into glucose with a little malt and subsequent fermentation) then legally just the same as Irish whiskey, provided it is given the customary colour and flavour? We wish we could persuade the Government chemists to give us the process by which they discover a spirit made from a mixture of malt and raw grain, and to teach us where whiskey ends and raw grain spirit begins. Until this is done we cannot admit the analytical turpitude on Mr. Stoddart's part dwelt upon by the *Chemist and Druggist*.

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When the Institute of Chemistry started it was not, we were assured, to interfere with the province of any existing body, but simply to devote itself to raising the standard of scientific chemists throughout the country. Having, even with all its intricate machinery of council and censors, failed to, as yet, do anything except collect a large amount of subscriptions (some of its members being busily engaged in running down fees, and unblushingly lending their names for advertising purposes without let or hindrance) it forthwith announces a "Conference" on "The Adulteration of Articles of Food," the notice of which says "*As Members only are admitted to take part in these Conferences, please bring this notice with you*"! All the learned societies in London we have ever heard of admit members of other learned societies as visitors, but this Institute still, as of yore, conducts its meetings on the secret principle. What can be the reason of this? Surely the Monthly meetings of the Society of Public Analysts are sufficient "conference" and conducted too by men who are daily engaged in food analysis. We shall watch with curiosity the results of this mountain in labour, but meantime it looks very like a case of an attempt to usurp the functions of our Society. It is possible that there are some organizers who would only be too thankful to see our Society dissolved, and our appointments transferred to their own pockets! Well we have done the work, and they are *only now beginning*.

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There are female Pharmacists, and why not, says Mrs. Dr. Hoggan, female analysts? We are liberal enough to say that we would welcome to our ranks any lady who had the courage to brave several years' training in a laboratory, but when Mrs. Hoggan proceeds to talk of women microscopists setting up as "Housekeepers' Detectives" and going about from house to house examining food (of course for a consideration) we fancy the power of nonsense can no farther go. We have consulted our respected better-half, and she says, "Just let one of them come poking her nose into my house, and we will soon see."

As an addendum to Mr. Hehner's interesting paper on condensed milk, on a previous page, we may reprint the following paragraph from the *Grocer*—

“The Anglo-Swiss Condensed Milk Company have made a profit for the past year of £60,000, which, after writing off £16,000 for depreciation of buildings and utensils, and adding £16,000 to the reserve fund, will leave available for distribution among the shareholders £28,000, equal to 18 per cent.”

We have received a large number of Abstracts from Public Analysts of their work under the Sale of Food Act during last year, but as we wish to publish the table in our next number, we should be glad if those Analysts who have not yet sent us their Abstracts, will kindly do so at once to enable us to make the table as complete as possible.

SALE OF FOOD AND DRUGS ACT AMENDMENT.—The Bill introduced into the House of Commons by Mr. Anderson, with reference to the prejudice to purchaser question, and a standard for the sale of spirits, has been referred to a Select Committee.

Mr. T. A. Collinge has been appointed Public Analyst for Rochdale.

Mr. W. F. Lowe, F.C.S., has been appointed Public Analyst for the County of Flint

Mr. C. F. Saunders, M.D., M.R.C.S. has been appointed Public Analyst for the City of St. Albans.

#### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price.
2281	C. W. Siemens ... ..	Regulating Electric Currents to Work Lamps ... ..	6d.
2350	C. D. Abel ... ..	Manufacture of Gas ... ..	8d.
2376	J. Hammond ... ..	Purification of Coal Gas by Concentrated Liquid Ammonia ... ..	6d.
2389	F. Wirth ... ..	Manufacture of Tar ... ..	8d.
2449	H. Unger ... ..	Manufacture of Soda ... ..	6d.
2516	W. Mead ... ..	Converting Spent Lime of Gas Works into Caustic Lime ... ..	4d.
2528	T. N. Kirkham and S. Chandler ... ..	Gas Purifiers or Scrubbers... ..	2d.
2533	J. J. Shedlock ... ..	Manufacture of Gas ... ..	6d.
2571	H. G. Rober ... ..	Manufacture of Anhydrous Sulphuric Acid ... ..	6d.
2644	G. V. Alsing ... ..	Treatment of Sewage, &c ... ..	2d.
2658	T. Heskin ... ..	Manufacture of Magnesium ... ..	2d.
2662	H. Kenyon... ..	Purifying Gas and Manufacturing Ammoniacal Salts ... ..	2d.
2695	G. Mackay... ..	Purification of Liquids ... ..	4d.
2733	W. L. Wise ... ..	Treating Impure Water and Sewage ... ..	6d.
2795	C. McCauley ... ..	Apparatus for Burning Hydrocarbons ... ..	6d.
2937	J. Adamson and H. Booth ... ..	Treating Refuse and Sewage Waters ... ..	2d.
4301	H. Simons... ..	Obtaining Sugar and other Compounds ... ..	10d.
4586	H. J. Haddon ... ..	Purifying Gas ... ..	2d.
4586	H. J. Haddon ... ..	Defecation and Refining of Saccharine Liquids ... ..	4d.

#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Boston Journal of Chemistry; The Dairymen; The American Dairymen; The Practitioner; American New Remedies; Correspondenz-Blatt; Kurze Chemische Mittheilungen, by Professor Franz Stolba; Medical Men and Manners of the 19th Century; Proceedings of the American Chemical Society. A new application of rapid oxidation by which Sulphides are utilized, by J. Holloway.

Mr. Perkins' note on Water Analysis will appear next month.

# THE ANALYST.

APRIL, 1879.

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## SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING of this Society was held on the 19th March, at Burlington House, Piccadilly, the President, Dr. Muter, M.A., F.C.S., in the chair.

Mr. Hehner was appointed scrutineer to open the voting papers, and reported that Dr. F. A. H. La Rue, M.A., Professor of Chemistry and Histology at Laval University, of Quebec, Canada, had been elected as a member.

Mr. J. W. Tayler, assistant to Dr. Baker Edwards, of Montreal, Canada, and Mr. J. Nimmo, assistant to Mr. Bernard Dyer, were proposed as associates.

Dr. Dupré read a paper "On Violet Powder," and Dr. Bartlett, Mr. Hehner, Mr. Wigner and Dr. Muter joined in the discussion which ensued.

Mr. Hehner read a paper "On the Proposed German Adulteration Bill"

Dr. Muter also read a paper "On the Proposed United States Adulteration Bill."

Mr. Wigner read a paper "On the Work done by Public Analysts under the Sale of Food and Drugs' Act during 1878."

The next Meeting of the Society of Public Analysts will be held at Burlington House on Wednesday, April 30th, at eight o'clock.

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## PROFESSOR CHURCH AND THE ROYAL AGRICULTURAL COLLEGE.

THE Royal Agricultural College at Cirencester is to suffer another very severe loss. Professor Church, who for the last sixteen years has been at any rate as far as chemistry is concerned, the life and soul of the Institution, is practically forced into resigning, because perforce when after all these years of hard work, he has decided to marry, it does not suit the powers that be that he should reside outside the College walls any more than it is likely to suit the Professor's inclination to take his wife within them. A good deal of correspondence on the matter has passed between Professor Church and the Principal, and those outsiders who are interested, and naturally so in the success of the College as a College rather than as a private seminary, and were anxious that the services of the Professor who, more than most, has helped to make the College what it is should not be lost; but the Committee of Management, to whom the final appeal was made, have given their decision, which virtually amounts to the conclusion, that at Cirencester, as at any ordinary boys' school, it is necessary that the "masters" should have other duties besides those involved in satisfactorily occupying the chairs of professional science.

We think we have seldom seen a resolution so meagre and even devoid of acknowledgment of the services rendered during a long term of years, as the following one, which was passed by the Committee of Management on the 5th March, 1879, and we can scarcely wonder that after the passing of such a resolution, Professor Lloyd Tanner, who occupies the Chair of Mathematics, and Professor Fream, who occupies the Chair of Natural History, have both sent in their resignations. The College will thus lose all the professors who can claim any position in the scientific world, while the principle supposed to be embodied in the Resolution will not be carried out, for the "vet" is already non-resident. We cannot help expressing our regret at the severance of the

connection of these gentlemen with an institution which *has* really been doing good work and its consequent decadence.

The following is the resolution referred to above:—

“The Committee of Management are of opinion that the discipline of the Agricultural College cannot be satisfactorily maintained, except by the residence of professors within the college walls in conformity with the original bye-law, No. 47. Being fully sensible of the services rendered by Professor Church during his sixteen years’ residence in the college, they the more regret that they cannot accede to his recent proposal of non-residence, a compliance with it involving such alterations as would unduly disturb the *present organization of the College Staff.*”\*

#### NOTE ON VIOLET POWDER.

By A. DUPRE', Ph.D., F.R.S.

*Read before the Society of Public Analysts, on 19th March, 1879.*

THE excitement produced last year in consequence of the numerous deaths occasioned by the use of arsenical violet powders, naturally drew attention to the question of violet powders in general, and several prosecutions for alleged adulteration of violet powder have since taken place. In one of these cases the vendor was convicted by the magistrate, but the conviction was quashed on appeal to the Salford Quarter Sessions. In a second case a conviction before a magistrate was also obtained, and no appeal, so far as I know, has yet been made.

Having been engaged for the Treasury in examining the various samples of violet powders instrumental in, or suspected of, producing arsenical poisoning, I have had my special attention directed to the subject of violet powder, and as some of my experiments not only throw light on the question as to the material best suited for such powder, but may aid analysts, and perhaps the magistrates, in deciding whether a given material is, or is not suited for the purpose proposed, I make no apology for laying the following simple facts before the Society:—

The powders experimented with consisted of the following materials:—Bermuda arrowroot, pure corn flour, wheat starch, potatoe starch with a little magnesia, corn flour with a little magnesia and orris root, Fuller’s earth, and two powders consisting almost entirely of crystallized sulphate of calcium. Nothing need be said regarding the physical condition of the various starch powders, or of Fuller’s earth, but a few words must be said regarding the last two powders mentioned.

Both these consisted almost entirely of crystallized sulphate of calcium, and both were decidedly rough to the touch. Under the microscope they were seen to consist of small crystals mostly with points as sharp as, nay sharper than, needles; some of these as much as  $\frac{1}{400}$  of an inch long by about  $\frac{1}{1000}$  broad. Altogether apparently as unsuitable material for dusting the delicate, broken skins of babies as could well be selected. Further acquaintance with some of the other physical characters of these powders does not diminish this first unfavourable impression. Violet powder is used chiefly for absorbing moisture and, other conditions being favourable, the more perfectly it does that the better it is.

In order to test the relative absorbing power of these powders let us spread small heaps about one-third of an inch broad by one-and-a-half inches long, on glass plates, microscopic slides for example, and place a drop of water on the same plate, just fairly

\* The italics are our own, *Editors' Analyst*,

in contact with one end of the powder heap. We shall find that the drop is almost instantaneously absorbed by the Fuller's earth, somewhat more slowly by the potatoe starch, still more slowly by the wheat, arrowroot and corn starches, and scarcely at all by the selenite powders. We may place drop after drop of water in contact with the Fuller's earth or the starch powders until the little heaps have become thoroughly moist by absorption from the one end, probably before the first, and certainly before the second, drop has become absorbed by the selenite. This simple experiment convincingly shows how little of true absorbing power these selenite powders possess. This conclusion is fully confirmed by the following experiments:—Small portions of the various powders were stirred up with cold water so as to form a very thin paste, which was left standing for one hour. At the end of that time the supernatant water was poured off and the remaining paste placed on blotting paper. After the lapse of a few minutes the moist powder was very gently pressed, with the fingers, between folds of dry blotting paper until no more moisture was taken up by the paper. Great care was taken to treat all the powders as nearly alike as possible. The amount of water contained in the powders thus treated was then estimated, and subtracting from this the water already present in the air dry powder, the amount of water taken up in the course of the above treatment was obtained. The results are given in Table II.; but, first, one other point has to be mentioned. The weight of equal bulks of these powders differ considerably, and hence it follows that the amounts of water absorbed per unit of weight, or per unit of volume, are not strictly proportional. The weight of any given volume of a powder differs also according to the way in which it has been put into the measure, but this variation seems fairly proportioned in all powders. In Table I. there are given the weights of 1000 grain measures of the various powders; firstly, when loosely put in; secondly, when shaken down (not compressed) as much as possible. As it may be a point of interest to some, I add the like particulars respecting white arsenic (sublimed, in the form of powder,) and terra alba.

TABLE I.

Nature of powder.	Weight in grains of 1000 grain measures.	
	Put in loosely.	Shaken down.
Wheat Starch ... ..	538	826
Pure corn flour ... ..	494	836
Bermuda arrowroot ... ..	580	857
Fuller's earth ... ..	692	951
White arsenic ... ..	1665	2366
Terra alba ... ..	700	1157
" " ... ..	758	1183
<i>Violet powders, made with—</i>		
Potatoe starch ... ..	596	811
Corn flour ... ..	489	762
" " second sample ... ..	407	672
Potatoe starch " " ... ..	610	829
Selenite powder, " " ... ..	633	1132
" " marked "steamer over globe" ... ..	629	1188

TABLE II.

Nature of powder.	Water absorbed by air dry powder, by	
	100 grains weight.	100 grains measure.
Wheat starch ... ..	72.0 grains	38.7 grains.
Pure corn flour ... ..	73.4 "	36.4 "
Bermuda arrowroot ... ..	81.3 "	47.1 "
Fuller's earth ... ..	82.1 "	56.8 "
<i>Violet powder, made with—</i>		
Potatoe starch... ..	92.3 "	55.4 "
Corn flour ... ..	76.4 "	37.2 "
Selenite powder ... ..	35.7 "	25.0 "
" " marked "steamer over globe" ... ..	39.9 "	25.1 "



A glance at Table II. will at once show how very inferior in absorbing capacity the two selenite powders are, and I cannot understand how it can be said "that they do not contain anything injurious to the skin, or unsuited for the purpose for which they are intended to be used as absorbent powders." To me it seems that they are very unsuited for use as absorbents, for which purpose nothing seems to be preferable to Fuller's earth or potatoe starch.

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### THE GERMAN ADULTERATION BILL.

By O. HEHNER, F.C.S.

*Read before the Society of Public Analysts, March 19th, 1879.*

ON another page of THE ANALYST the readers will find a translation of a draft of a Bill now under discussion before the German Parliament, to regulate the sale of food, articles of consumption, toys, wall papers, colours, cooking utensils, and paraffin oil. I do not propose to make any lengthy remarks on the Bill, since its clauses speak for themselves, and since other members of the Society are much more competent than I am myself to criticise the various provisions touched by it.

Most remarkable, to my mind, is the absolute want of any regulations in it concerning the analysis of the samples; whilst the purchase of samples, definition of adulteration, and punishment of offenders, are all spoken of at length, the word analyst does not even occur in the measure. The "Superior Court of Administration" will appoint the officers under the Act, but it is not even stipulated which shall be the "Court of Administration."

Far more interesting to us than the various clauses of the Bill itself are the voluminous papers accompanying the draft, which supply the reasons for and justify the several clauses. From a statistical table it appears that, in the year 1878, no less than 231,478 samples of food, drink, and other articles coming under the law, were analysed in the German Empire; of these 3,508 were adulterated (1.5 per cent.), 1,538 articles of food were decomposed and unfit for consumption, and 3,332 convictions of offenders were obtained. Of this enormous number of samples, milk stands first with 152,043 samples; beer, 17,628; sausages and meat, 21,380; flour and bread, 17,202; condiments, 1,168; wine, 842; sugar and confectionery, 508.

In Munich, 90,693 samples were analysed (87 convictions); Berlin, 75,867 (889 convictions); Darmstadt, 17,701 (190 convictions); Karlsruhe, 12,346 (160 convictions); Mannheim, 7,807; Heidelberg, 5,800; the remainder in 78 different towns and districts.

In explanation of the very large number of samples, it is to be stated that several towns, such as Berlin and Munich, have included in their returns all examinations made by market inspectors. The greater proportion of adulterated samples was, however, detected by accurate analytical examination.

A commission, including such well-known names as Drs. Hoffman, Fresenius, Knapp, and Varrentrapp, report at length on the various practices of adulteration. Among many modes of adulteration well known to all analysts, it will be learned with some interest that, instead of alum or sulphate of copper, sulphate of zinc has been used and detected in bread and flour, and that ground gypsum is regularly exported from Rotterdam into Germany, under the designation, "Artificial Flour," for adulterating flour. Quantities of gypsum up to 30 per cent. have actually been discovered in such

adulterated flour, and sulphate of baryta up to 20 per cent. Maccaroni were found coloured with picric acid, brewing sugar contaminated with arsenic, milk mixed with soapsuds, beer with narcotin, coffee coloured with chromate of lead. But all these adulterations were observed only in single or very rare instances.

The laws and regulations concerning the sale of food of no less than 48 countries and cities are added to the report, English legislation being very fully treated of. The work done by the Society of Public Analysts is fully acknowledged, and the success of the "Sale of Food and Drugs Act," so far as that Act is a success, to a great extent attributed to the labours of the Society. The information afforded to Dr. Rottenburgh is worked into a general criticism of the "Sale of Food and Drugs Act," and has in several items been made use of in the drawing up of the Bill.

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### THE GERMAN GOVERNMENT AND ADULTERATION.

TRANSLATED BY O. HEHNER, F.C.S.

THE GERMAN GOVERNMENT has just laid before the German Parliament the following Bill, to regulate the sale of food, articles of consumption, &c. :—

§ 1. The sale of food and articles of consumption, as well as the trade in toys, paperhangings, colours, eating, drinking, and cooking utensils, and petroleum, is to be regulated by this Act.

§ 2. The officers of the Sanitary Police are empowered to enter any rooms in which the articles, coming under § 1, are kept for sale, during the usual business hours, or whilst the rooms are kept open for sale.

They are authorised to take, according to their choice, for the purpose of analysis, samples of the articles coming under § 1 and which are kept in the sale rooms, or which are sold in public places, upon market places, squares, streets, or which are hawked about. If requested, part of the sample must be left with the vendor, properly secured or sealed. For the sample the usual price is to be paid to the seller.

§ 3. The Sanitary Officers are empowered to make inspections of the premises of persons who have, according to §§ 10, 12, 13 of this Act, been sentenced to imprisonment, or of rooms in which articles specified in § 1 are kept for sale, or in which such articles intended for sale are stored.

This power of inspection begins with the date at which the sentence takes force, and ceases after three years, from the date on which the term of imprisonment ceases, or is remitted.

§ 4. Sanitary Officers, in the meaning of this Act, are the Medical Sanitary Officers, as well as those officers which are nominated as such by the Superior Court of Administration. The Central Authority of the Empire will decide which court has to act as Superior Court of Administration.

§ 5. By Imperial Decree, with assent of the Federal Council, regulations for the protection of health may be framed to prohibit

1. Certain modes of preparing, storing or packing articles of food or consumption intended for sale.

2. The trade and offering for sale of articles of food or consumption, of certain conditions, or under a name not corresponding to their real condition.

3. The sale and offering for sale for slaughter of animals, suffering from certain diseases, as well as the sale and offering for sale of the flesh of animals which were affected with certain diseases.

4. The use of certain substances and colours for the manufacture of wearing apparel, toys, paperhangings, eating, drinking, and cooking utensils, as well as the sale and offering for sale of articles manufactured contrary to this regulation.

5. The sale and offering for sale of petroleum of a certain nature.

§ 6. By Imperial Decree, with assent of the Federal Council, the manufacture, sale, or offering for sale, of articles intended for adulterating articles of food or consumption, may be prohibited or limited.

§ 7. The Imperial Decrees, issued under § 6, are to be laid before the next following session of Parliament. They are to be put out of force as soon as Parliament so requires it.

§ 8. Whoever acts contrary to the regulations of §§ 5, 6, is punishable with a fine up to 150 marks (1 m.=1s.), or with imprisonment.

§ 9. Whoever, contrary to regulations of §§ 2 to 4, refuses entry to the rooms, the taking of samples, or inspection, is punishable with a fine from 50 to 150 marks, or with imprisonment.

§ 10. Liable to imprisonment up to six months, and to a fine up to 1,500 marks, or to either of these, is—

1. Whoever, for the purpose of fraud in commerce, imitates articles of food or consumption, or adulterates the same by deteriorating them by the subtraction or addition of substances, or gives them the appearance of a better quality.

2. Whoever, knowingly sells articles of food or consumption, which are spoiled or imitated, or adulterated according to § 1, without giving notice of these circumstances, or offers them for sale under a name liable to lead to deception.

§ 11. If offences mentioned in § 10 have been committed by negligence, a fine up to 150 marks or imprisonment is to be inflicted.

§ 12. Liable to imprisonment, and to loss of civil rights, is—

1. Whoever prepares articles intended for the food of others in such a manner that their consumption is calculated to injure health, also, who knowingly sells, offers for sale, or otherwise brings into circulation as articles of food or consumption such articles which are injurious to health.

2. Whoever intentionally manufactures wearing apparel, toys, paperhangings, eating, drinking, and cooking utensils, or petroleum, so that the probable use of these articles proves injurious to health; also, who knowingly sells such articles, offers them for sale, or otherwise brings them into circulation.

The attempt is punishable—

If, through the action, grievous bodily injury, or the death of any person has been caused, penal servitude up to five years is to be inflicted.

§ 13. If, in the cases of § 12, the consumption or use of the articles was liable to destroy health, and if that circumstance was known to the vendor or manufacturer, penal servitude up to 10 years, or, if the death of any person was caused, penal servitude not under ten years, or for life, is to be adjudged.

Besides the punishment, supervision by the police may be ordered.



On looking at the composition of cocoa, as thus shown forth, the great fallacy of countenancing the addition of starch and sugar is at once apparent. The only possible excuse is the dilution of the fat, but then at the same time, the nutritious gluten and stimulating theobromine are equally reduced in value. On the other hand, given the removal of a portion of the fat, the other constituents are not only kept intact, but positively concentrated in a high degree. A glance at the following analyses of packet cocoas will prove the force of my remarks:—

	No. 2. Fat partially removed (Cocoa Essence).	No. 3. Mixed with starch and sugar (most of the latter).	No. 4. Also mixed with starch and sugar (most of the former).	
Fat ... ..	19.22	20.15	22.10	} 100.00
Sugar and gum ... ..	12.15	33.50	27.42	
Starch ... ..	22.37	27.21	29.22	
Cocoa red, &c....	4.60	1.60	1.80	
Cellulose ... ..	8.70	3.46	4.30	
Theobromine ... ..	1.20	.43	.50	
Gluten ... ..	18.30	6.45	7.36	
Ash ... ..	4.70	1.70	1.80	
Moisture ... ..	8.76	5.50	5.50	

For the sake of comparison I will put down the important constituents by themselves:—

	No. 1. Genuine.	No. 2. Fat removed.	No. 3. Mixture.	No. 4. Mixture.
Theobromine ... ..	0.90	1.20	.43	.50
Gluten ... ..	12.21	18.30	6.45	7.36

Thus we clearly see the nonsense talked by those who, for reasons best known to themselves, are found to palliate, and even support in writing, the "preparation" of cocoa by mixing it with starch and sugar.

In conclusion, I have only to urge those interested in the purity of food to expose and put down the mixture of cocoa with starch and sugar as useless, and founded altogether on a wrong basis. Unfortunately we, as public analysts, are prevented by a decision from reporting such mixtures as adulterated, but we none the less ought to teach the public by every means in our power to desert their use and stick entirely to the unmixed article, which, although dearer at first sight, is by far the cheaper in the end.

### NOTE ON WATER ANALYSIS.

By FRANK P. PERKINS, Public Analyst for Exeter.

It is probable that what I now write may have come within the experience of every analyst.

In the determination of ammonia good results are obtained by the following method of manipulation:—Into a half litre retort place 25 c.c. of a solution of potassic permanganate, prepared according to the usual formula, add 100 c.c. of pure water, and distil until no reaction is obtained with Nessler's test; now add 250 c.c. of the water to be examined, and distil again until free from ammonia. The distillate contains albuminoid and free ammonia. The free ammonia alone is determined in another 250 c.c. of the water. By operating thus all traces of ammonia are expelled from the reagents and apparatus, and results as near perfection as the process will allow attained.

ON THE WORK DONE BY PUBLIC ANALYSTS UNDER THE SALE OF FOOD AND DRUGS' ACT DURING 1878.

By G. W. WIGNER, F.C.S.

*Read before the Society of Public Analysts, on 19th March, 1879.*

FROM the information kindly furnished by most of our members, and by some gentlemen who are not members, I am again enabled to lay before the Society a very fair summary of the amount of work done during the past year, under the above Act, in nearly the whole of the districts in the country. The number of districts the returns I have received relate to, is 168, as against 127 districts for 1877.

The percentage of adulteration calculated upon the whole number of samples examined shows a slight improvement, and this I think will be best seen by putting it in tabular form. During the time of the *Lancet* commission the percentage of adulteration was :—

During 1872	...	...	...	...	...	...	...	...	65.0
" 1875-6	...	...	...	...	...	...	...	...	26.0
" 1877	...	...	...	...	...	...	...	...	18.1
" 1878	...	...	...	...	...	...	...	...	16.58

It is of course very satisfactory to find that, notwithstanding the obstruction caused in various parts of the country by the "prejudice to purchaser" question, the percentage of adulteration is still gradually decreasing.

As compared with 1877, the number of samples analysed shows a slight increase. In the two years ending December, 1876, the total number examined and reported to us was 15,989; in 1877, 14,785; and in 1878, 15,107.

The next most interesting point is probably to see in what way the per centage of adulteration has altered in different kinds of samples, and perhaps the best mode of showing this is to place side by side the results for the years 1877 and 1878, the figures in each case being the percentage of adulterated samples found, calculated on the total number of that particular sample purchased. We thus get the following results :—

				1877.				1878.
Milk	...	...	...	26.07	...	...	...	18.38
Butter	...	...	...	12.48	...	...	...	13.23
Groceries	...	...	...	13.00	...	...	...	12.89
Drugs, &c.	...	...	...	23.82	...	...	...	35.77
Wines, &c.	...	...	...	47.00	...	...	...	29.31
Bread and Flour	...	...	...	6.84	...	...	...	2.97
Sundries	...	...	...	21.63	...	...	...	14.98

In the returns for 1877 the worst place was occupied by wines and spirits, but this year drugs appear as the worst on the list. From some of the statistics it appears only too probable that this is not by any means the fault of the chemists and druggists, but that it arises from some inspectors having purchased samples of so-called drugs from grocers' shops, or at other places where drugs had no business to be sold; and as will be seen by the remarks in the table, the list includes a large number of samples of violet powder. It would be much more satisfactory if it were possible to state what proportion of these drugs were really pharmacopœia drugs, and how many were articles in reference to which a difference of opinion does exist, whether it is justifiable or not.

Next on the list this year comes wines and spirits, but with a very great reduction from the figures of last year. Milk also shows a reduction of more than seven per cent., and in fact I think for the first time since returns of this kind have been collected it falls

below 20 per cent., or one-fifth of the samples purchased. Butter appears to be fractionally worse, but it seems not at all improbable that this slight increase may be due to the more universal adoption of efficient methods of carrying out the analysis. Bread and flour and groceries show a decrease, but it is even now a very serious thing that on a standard article of food like bread three per cent. of the samples examined should be found adulterated. The sundries also show a decrease, but, unfortunately, these in so many cases include water, which when condemned as unfit for drink, is included in the column for adulterated samples, that no special deduction can be drawn from this item.

Looking at the returns in another light, and taking the percentage of adulterated samples of each kind included in the total number of adulterated articles only—that is, there were 2,208 adulterated samples, the description of which has been particularly reported—I find that:—

Milk	...	...	...	formed	...	42.21	per cent.
Butter	...	...	...	"	...	3.35	"
Groceries	...	...	...	"	...	18.07	"
Drugs	...	...	...	"	...	5.53	"
Wines and Spirits	...	...	...	"	...	23.33	"
Bread	...	...	...	"	...	1.54	"
Sundries	...	...	...	"	...	5.97	"
						100.00	

Here we have an increase in the case of milk from 36.6 to 42.23 per cent., of drugs from 4.2 to 5.52 per cent., and a decrease in the case of wine, bread, and sundries from 27.6, 3.1 and 7.7 per cent. respectively, to 23.35, 1.53 and 5.97 respectively.

We will next look at the percentage of adulterated samples in different districts. Southampton heads the list with 53.4 per cent. of the samples purchased. Yorkshire (East Riding) and Hull and Liverpool follow closely after, each of them having more than 40 per cent. Preston and North Derbyshire are between 40 and 30. Lancashire, Warwickshire, Londonderry and Yorkshire (West Riding) have more than 25 per cent.; Cheshire, Lewisham, Antrim, Belfast, Donegal, Tyrone, Surrey and St. Pancras more than 20 per cent. Guildford, Hants, Westminster, Durham, Staffordshire, Cork, and Sheffield more than 15 per cent.; while some of the remaining districts are perhaps sufficiently interesting as showing the greater purity prevalent there as to justify their being separately tabulated. Thus we find that Gloucester and Hereford show 1.4 per cent., Leeds 2.3 per cent., Dublin 2.6 per cent., Bedfordshire 5.9 per cent., Wandsworth, Lambeth, &c., 8.7 per cent., Devon 9.7 per cent., Hampstead 11.1 per cent., Cardigan, Carmarthen and Swansea 12.4 per cent., Somersetshire, Bristol, &c., 12.8 per cent., Hackney 14.2 per cent., and Greenwich 15.0 per cent. St. Martin's-in-the-Fields has only so recently been put into the efficient hands of Mr. Heaton that it is perhaps scarcely fair to notice that he has not yet come across any adulterated samples.

Referring now to another very important feature in these returns I find that in Barnsley, Chesterfield, Glossop, Denbighshire, Oban, Montgomeryshire, Lancaster, Cavan, Dumbarton, Paisley, Ashton-under-Lyne, Pontefract, Wakefield, King's Lynn, Deal, Faversham, Margate, Sandwich, Stratford-on-Avon, Warwick, Gloucester, Herefordshire, Huntingdon, Falkirk, Fifeshire, Brecon (city and county), Tenterden, West Suffolk, Maidenhead, Beverley, Monmouth, Norfolk, Reigate, Kilmarnock, Renfrewshire, and Sutherlandshire, or altogether 10 counties and 27 towns, with a population of close on 2,000,000, no samples whatever have been analysed, and this is perhaps one of the most striking proofs of the necessity of amending the Act, so as to render its working

compulsory. While in 23 more towns, with a population altogether of about 850,000, only 271 samples, or an average of less than 13 per town, have been examined, although these include such populous places as Edinburgh, Cambridge, Yarmouth, and at least one of the London Districts, Mile End Old Town.

There are also 13 counties, viz., Carlow, Kildare, Leitrim, Fermanagh, Westmeath, Queen's County, Wexford, Cornwall, East Riding of Yorkshire, South Derbyshire, Donegal, Londonderry and Tyrone, with a united population of about one and three-quarter millions, in which only 205 samples have been analysed, or an average of about 16 per county.

In Scotland hardly anything has been done, owing to the decision given there on the "prejudice" question. Only 96 samples were examined as against 350 in 1877.

In Ireland 3,495 were examined, of which 342 were adulterated, or 9.78 per cent.

This, of course, is largely due to Dr. Cameron's enormous number of 2,785 samples; 203 of these, or 7.28 per cent. being adulterated.

There were four cases of diseased milk reported, one from each of Mr. Heisch's districts, and two from one of my own. Mr. Heisch also examined some samples of starch, which can hardly be considered as a food, and Dr. Barclay reports having examined gas containing carbonic acid.

The prejudice question seems to have been raised in about 30 places, and in no less than 9 it has been upheld by the Magistrates. As this decision may have a very important bearing on the results previously referred to, it is as well to note that these places are Canterbury, Derby, Southampton, Glasgow, Cornwall, Sheffield, Cumberland, Lancashire, and York, and as the practical result, inspectors have ceased taking samples in Newcastle, Southampton, Derbyshire, Cambridge, Brighton, Yarmouth, Cumberland, Hull, Durham, Dumbarton, Maidstone, and in Scotland generally.

In West Suffolk the Magistrates are of opinion that the police have enough to do already, and therefore they have never collected any samples at all. Adulteration is reported to be on the increase at Southampton, which figures highest in the table, Glasgow, King's Lynn, Sheffield, Yarmouth, and Hull, at most of which places the Act is practically a dead letter.

In reference to spirits, if the adulteration is simply a dilution with water the Magistrates will not convict at Bristol, Londonderry, Hackney, or Stockton, while at Hull and Cork it has been decided that no prosecutions shall be undertaken until a standard has been fixed.

The Magistrates at Cardiff have given the unique decision that the exact price of the article purchased must be tendered by the inspector, and no change be required, and as another equally amusing illustration of Magistrates' wisdom, I may mention that Mr. Collins reports that in Cornwall, a case was dismissed because the certificate stated that the "sample of milk" was marked, and the Bench decided that it was impossible to mark a sample of milk, but only the bottle containing it!

In the discussion which ensued,

Dr. Bartlett said they might consider that for some time past the Act had been a dead letter where it had previously been an advantage, and adulteration was now more or less in the ascendant in consequence. He thought the returns showed the advantage that a better constituted Act would create, and also the necessity for making the Act compulsory.

Dr. Muter said that he thought the returns did not tell the truth about drugs; what some people deemed an adulterated drug, other people did not. There was nothing that a standard was so much wanted for as drugs, and if there was to be an amendment in the Act, he hoped there would be one as to drugs.



## THE STANDARDIZING OF PERMANGANATE OF POTASH, BY MEANS OF PLUMBIC OXALATE.

BY PROFESSOR F. STOLBA.\*

INSTEAD of using oxalic acid the author prefers its lead salt, for the following reasons:—

1. It does not contain water, and can always be got pure.
2. It does not take up any moisture even after several days' exposure to the air.
3. Its high molecular weight (one part of it =  $\cdot 427227$  parts of oxalic acid), also gives it an advantage over oxalic acid, as good results may be obtained even by using a less delicate balance.

The process of standardizing is conducted in exactly the same manner as when oxalic acid is used. Dilute sulphuric acid is added, and the liquid heated; plumbic sulphate and free oxalic acid are formed. One gram of plumbic oxalate corresponds with

$\cdot 379757$  Iron.  
 $\cdot 189878$  Calcic Oxide.

The author gives the results of four experiments which agree exceedingly well, different quantities of plumbic oxalate being taken each time for the standardizing. The following process is used by the author to prepare pure plumbic oxalate:—Plumbic acetate is dissolved in water, acidified with acetic acid, the solution boiled with lead foil to throw down traces of copper or silver, then precipitated with oxalic acid in excess. This precipitate is washed by decantation with water till the washings are no longer acid, then dried at  $120^{\circ}\text{C}$ . and kept in a well-closed bottle.

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## THE ANALYSIS OF WINES.

By R. KEYSER.†

THE author calls the attention of analysts to the following somewhat unpleasant fact:—An analytical chemist of good repute analysed some time ago a sample of wine for a wholesale dealer by the usual process, viz., estimation of alcohol, extract, acids, and ash, also by its action on polarized light. The results of the analysis justified him in reporting: There is not the slightest doubt this wine is genuine from a chemical point of view. Now the wholesale dealer acknowledges his wine to be an *improved* one. In what the improvement consists he does not mention. But whether it consists in plastering, sugaring, colouring, or fortifying, his wine is adulterated.

It now appears that this ordinary process is insufficient. A more complete analysis and estimation of every constituent must be made to form an opinion. The author strongly recommends the complete analysis of the ash. The relative amounts of lime, magnesia, potash, soda, sulphuric acid, phosphoric acid, and silicic acid are more constant in wines of the same origin than has generally been believed.

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THE COLOUR MEASURER.—Professor Koenig, of the University of Pennsylvania, has designed a new instrument, which he calls a chromometer for determining the amount of metals in ores. He prepares borax beads, containing known quantities of the metal to be estimated, and notices of what thickness a glass of the complementary colour to the bead must be to make it appear colourless. The coloured (green or red) glass used, is of wedge shape, and is provided with a graduated rack movement, by means of which a reading is obtained, that, on referring to a special table, gives the amount of the metal present. By this process an estimation of manganese can be made in 15 minutes.

\* Correspondenz blatt des Vereines, Analytischer Chemiker, Jahrg. 2, No. 3.

† Kurze Chemische Mittheilungen von Prof. Fr. Stolba.

## THE LONDON WATER SUPPLY.

DR. TIDY'S annual report on the quantity and quality of the London Water Supply is somewhat more than usually interesting this year, because of the discussion likely to take place in Parliament on the matter. Dr. Tidy adheres to his often expressed favourable opinion as to the general character and quantity of the supply, and he probably brings more figures of reliable analyses to prove his point than would be available from any other source. It is, of course, greatly to be regretted that the analyses made by Dr. Frankland are not published in such a form that they would admit of direct comparison with those of Dr. Tidy, and we think it is also to be regretted that both gentlemen appear for all practical purposes to ignore the use of the microscope. Surely there is nothing which can so readily throw light on any points, which may otherwise appear mysterious in water analysis, as a careful microscopical examination of the water itself and its sediment; more especially would this be the case, if in the analyses we are now referring to, Dr. Tidy had given us any statistics of the microscopical appearances, presented by the Thames and the East London waters. The analyses given enable a comparison to be readily made between the unfiltered and filtered Thames water, and the result appears satisfactory. The filtration has been fairly efficient, and the oxidisable organic matter has been fully one-fourth oxidised, notwithstanding a slight increase of chlorine pointing probably to the fact that concentration has taken place.

## SHORT NOTICES OF BOOKS.

OUR DOMESTIC POISONS. *By Henry Carr, M. Inst. C.E.\**—This little pamphlet collects within the space of fifty pages a vast number of instances of the poisonous effects of certain dyes and colours used in domestic fabrics. Special attention is, of course, given to arsenical wall papers, arsenical green muslins, and chromic green gloves. The *brochure* is forcibly and concisely written, and worthy of attention by both our Legislature and the general public. Mr. Carr is evidently in earnest, and we wish his efforts every success. It would be a most excellent matter to be taken up by some energetic M.P.

MEDICAL MEN AND MANNERS. *By 'Αχι Θάσσευτος.*—The original edition of this amusing book was published in 1876, and the second is now before us. It has been extended to 180 most readable pages. Once take it up, and you are certain of a pleasant hour's entertainment, and not merely that, but also food for deep thought and regret that the noble profession of medicine should be made so often the cloak of incapacity and quackery. It should certainly be read by every medical man desirous of maintaining his professional dignity.

THE HYGIENE OF THE SKIN. *By J. L. Milton.†*—This shilling pamphlet is the work of the lecturer on skin diseases at St. John's Hospital. It is designed as offering in a popular form "a set of rules for preserving the skin in a high state of health, and assisting the restoration of it to a proper standard when the reader is under treatment for disease affecting this part of the frame." Even with this apology, however, we can scarcely see the necessity for such a work, seeing that any one under treatment would as a matter of course receive his instructions from the medical man who had the case in hand; besides, as a rule, we do not think popular works on medical subjects very desirable. As to its medical merits we are of course dumb; so we can only say that it appears to be well and concisely written, and gives much information as to the necessity of cleanliness, &c. We should think that it will prove popular.

\* London: W. Ridgway, Piccadilly. † London: Baillière, Tindall, and Cox, King William Street, Strand. ‡ London: Chatto and Windus, Piccadilly.

## CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

## CANE SUGAR IN MILK.

TO THE EDITOR OF "THE ANALYST."

SIR,—Mr. Collins, in his reply to me, does not give those details of the analysis of his sugared milk which are requisite to enable every chemist to judge of the solidity of Mr. Collins's conclusions. Will he kindly state (1) the extent of dilution of the whey used for titration, (2) the amount of Fehling's solution employed, and its strength in copper, (3) the quantity of whey required for reduction of the Fehling's solution, both before and after inversion? I ask for this information because Mr. Collins appears to have got the amount of lactose by deducting the casein and cane sugar from the amount of solids not fat. Surely he must have obtained it also by direct titration. I confess that I know of no *accurate* method of estimating cane sugar in the presence of milk sugar. I intend to try the method of Tollens, as used by Mr. Hehner, and also the new and beautiful method of Dr. Pavy (Pr. Roy. Soc., Jan., 1879) for the estimation of glucose.

Yours, &c.,  
THOS. STEVENSON.

## CONDENSED MILK.

TO THE EDITOR OF "THE ANALYST."

SIR,—I hope I am not asking too much in requesting you to allow me to reiterate a few remarks in reply to Mr. Wigner's criticism on my paper on "Condensed Milk." I thought I had clearly and conclusively answered the criticisms in question at the last meeting of the Society of Public Analysts, but as my reply is not reported in *THE ANALYST*, I am in justice entitled to explain:

In all cases the cane sugar was acknowledged to be deduced *by difference*, hence "the totals cast up as they do"; in a few cases the figure was checked by direct experiment and then fairly agreeing results were obtained.

I adhere to my calculation, namely, that 2.69 parts of fresh milk have been condensed into one, both the amount of total milk solids not fat, and the percentage of mineral matter proving the correctness of this figure. The sugar used *cannot* have contained much ash, otherwise the proportion of ash would have been much higher. The average of mineral matter was found to be 1.98. This, divided by the condensation, 2.69, gives 0.73 as the percentage of ash in the original milk, a very trifle higher than the average amount.

Had, further, really anything like a considerable decomposition or loss of casein taken place, and had a larger proportion of milk than 2.69:1 been evaporated, the amount of ash would of necessity be higher. Thus the single item ash does entirely disprove Mr. Wigner's statements.

Of course it is quite possible that during the evaporation some of the casein, and with it a proper proportion of other constituents, may have been mechanically lost, but this does not affect my analyses, which merely show what *is* in the condensed milk. One might as well argue that the milkmaid spilled the milk, hence really 3.6 instead of 2.6 parts of milk were originally used.

In no case did the ash of condensed milk effervesce with acids, and carbonates, derived from sugar, beyond the usual traces, were absent.

I should be happy to learn what better process for the determination of sugar than that used by me could be employed. Perhaps the polariscope, when there is in the milk, cane sugar, invert sugar, lactose and galactose, and possibly rotating nitrogenous matter?

I am, Sir, Yours &c.,  
OTTO HEHNER.

LONDON, 5th March, 1879.

P.S.—Since writing the above I have carried out Mr. Wigner's suggestion, and have made a full analysis of the ash of condensed milk. The following are the results, together (for the purpose of comparison) with an analysis of ash of genuine milk, quoted by Wynter Blyth:—

	Condensed Milk.	W. Blyth, Genuine Milk.
Ca O	22.63	22.97
Mg O	2.34	3.31
Na <sub>2</sub> O	7.22	11.58
K <sub>2</sub> O	27.77	18.82
P <sub>2</sub> O <sub>5</sub>	25.30	27.03
S O <sub>3</sub>	1.89	—
Cl	16.08	16.23
	103.23	99.94
Minus Oxygen for Chlorine...	3.62	
	99.61	

There was a very small quantity of carbonic acid (as Ca CO<sub>3</sub>) in the ash, but this I have not determined.

## DUTIES OF PUBLIC ANALYSTS.

TO THE EDITOR OF "THE ANALYST."

SIR,—Will you allow me sufficient space in your next issue for an insertion of the following remarks upon certain editorial comments which appeared in "Notes of the Month," for March, No. 36?

No public analyst, whatever his private opinions may be, can form an "exception to the rule," but must stand to the Sale of Food and Drugs' Act, and to his official duties in the same relation as do all his compeers: his duty is to *inspect* articles submitted for analysis, and to *detect* adulterations; he is at once *inspector* and *detective*, and is therefore the chief agent by means of which the interests of the Acts, which he ought to feel he represents, namely the detection and suppression of adulteration, are consummated.

The public analyst may represent the interests of the Acts, without himself being what is commonly called an interested party; if he fully carries out the duties of his office he will give to the people genuine articles of consumption, thus his duties and the interests of the Acts are identical, and in this sense the public analyst is a representative man, and certainly need not be oblivious, but rather think with pride of his position as such.

The legislature recognised and made special provisions to keep free from personal influences the disinterested representation of the interests of the Acts by the public analyst, by inserting the clause which prevents him from trading in articles of food, drink or drugs.

In another Note of the month it is pointed out that the analyst should have taken it upon himself to direct the actions of the inspector, as to the advisability of prosecuting. How could he do this without being the very personification of the interests of the Acts? In Note one the analyst is said to have usurped the functions of the inspector by making a statement whilst under cross-examination, in Note two he is taught how to usurp them by actual interference.

Why the editors or any member of the Society of Public Analysts need fear to boldly assert what is patent to all I cannot understand.

Yours &amp;c.,

March 5th, 1879.

ARTHUR ANGELL.

## LAW REPORTS.

**ADULTERATED MILK.**—William Wharfe, farmer, was summoned at Bradford, for selling adulterated milk. Inspector Chambers stated that he purchased a pint of milk from the defendant and gave it to the public analyst, whose report stated that the milk was adulterated with 10 per cent. of water. The defendant said one of his cows was taken ill and gave short milk, and he put a little water to it to make the proper quantity. The Town Clerk remarked that the milk was not only adulterated, but from a cow which was ill. The Mayor said the case was a very bad one, and they had been considering whether they should not fine the defendant £10, but he would be let off with £5 and costs.

**THE "PREJUDICE" OBSTACLE OVERCOME.**—At Westminster, Mr. Freeman, Kings Road, Chelsea, was summoned for selling adulterated milk. Mr. Young, inspector of the Parish of St Luke, stated that he purchased a quart of milk at the shop of the defendant, and told him he required it for the purpose of analysis. He divided it into *four* parts, one for himself to use, another to keep, one for the analyst, and one he gave to the defendant. The certificate of Dr. Barclay, showed that the milk contained at least 19 per cent. of added water. He (Mr. Young) had suffered no ill-effects from the milk he took in his tea, although he must have been "prejudiced," as it was not pure. The magistrate fined the defendant 20s., and 2s. costs.

**ADULTERATING BEER WITH SALT.**—Frank Evans, of the "Mug House," Worcester, was summoned for having sold ale adulterated with salt. Mr. Beauchamp defended. Constable Checketts said he bought two quarts of ale from defendant's wife, and handed it to Dr. Swete, the county analyst. Dr. Swete stated that the beer contained 66 grains of salt per gallon, and it was considered in such cases, that where the quantity was more than 50 grains it was excessive, and justified a prosecution. He had analysed the water of the well of the "Mug House," and it contained 6·1 grains of salt per gallon. Malt and hops would contain 8 grains of salt; so that there should only be 14·1 grains of salt per gallon if the beer was honest beer. The strongest honest beer that could be brewed would only contain 22 grains of salt per gallon. The Bench thought it was a case in which a small penalty should be imposed by way of caution. They fined defendant 1s. and £1 2s. costs.

**ADULTERATED BUTTER.**—Joseph Jordan, William Sawyer, and Edward Copley, grocers, Rotherhithe, appeared to summonses charging them with selling butter which, on being analysed by Dr. Muter, contained from 70 to 80 per cent. of animal fat, but no appearance of butter. In the first two cases printed notices were put on the butter, "Sold at 1s. 2d. per lb.;" and in the third case the defendant pleaded that when asked for butter at the price named, he told the man who was sent by the inspector to make the purchase, that it was not butter, but "butterine;" and that on the man asking him what "butterine" meant, he told him he knew as well as he did himself.—The Magistrate imposed fines of 20s. and 2s. costs in the first two cases, and dismissed the third summons, as information was given to the purchaser, before the purchase was made, that what was sold was not butter.

**IMPORTANT CASE.**—At the Manchester County Police Court lately, Thomas Beswick, farmer, Toft, near Knutsford, was summoned for having sold milk not of the substance and quality demanded. Mr. Gardner, who prosecuted on behalf of the Milk Dealer's Protection Society, said the complainant was a milk dealer in Salford, and the contract for the delivery of milk to him from the defendant was made at Old Trafford. The milk in question consisted of eight gallons. Whilst the milk remained in the defendant's can, Mr. Owen, secretary to the Society, took three samples. It would be shown that there were about eight parts of cream abstracted more than was usually allowed by analysts. That was the second time the defendant's milk had been tested and found wanting. One of the Magistrates wanted to know if Mr. Gardner could inform him of the minimum amount of cream in milk? Mr. Gardner replied about 30 per cent. The Magistrate said that this must be in excess of what possibly came from the cow. Mr. Gardner: The defendant's milk ought to have contained eight per cent. of cream above what was actually found in it. The Magistrate: Was the milk impure? Mr. Gardner: We do not charge him with selling impure milk, it is with extracting the cream therefrom. The article was not of the substance demanded. The Magistrate: Has there been any case decided on this point before, I never heard of such a case. The magistrate's clerk said he never heard of a similar case. Another Magistrate, to Mr. Gardner: Do you mean when the cream was taken off that it was skimmed milk? Mr. Gardner: Instead of having sold new milk he sold an article from which the fatty matter had been extracted. In fact it was what was called "blue" or skimmed milk. Evidence having been given in support of the case, the magistrates after a short consultation, dismissed the charge on the ground that a private instead of a public analyst, as required by Act of Parliament, had been employed in the matter.

**CASTOR OIL PILLS.**—At the Lancaster Police Court, on the 15th March, R. Taylor, manager of the Carnforth branch of the Lancaster, &c., Co-operative Society, was charged with selling, to the prejudice of the purchaser, a box of pills, purporting to be "Compound Castor Oil Pills," which were not of the nature and substance demanded. Mr. W. Sharp appeared in support of the information, and Mr. Byrom defended on behalf of the manufacturers of the pills, Messrs. Bell and Sons, chemists, of Liverpool. The case was before the Bench on the 1st instant, but was adjourned, in order that Dr. Campbell Brown might be cross-examined upon his certificate. Mr. Sharp said it would be remembered that upon the last occasion Supt. Moss gave evidence that he went on a certain day to the Store at Carnforth, and there saw defendant, and asked him whether he had got any castor oil pills, and that defendant replied, "Yes, plenty." The Superintendent then asked for a box, and was supplied with what was described as castor oil pills, for which he paid one penny. He told defendant that he had purchased them for the purpose of analysis, and asked him whether he wished to have them divided, but defendant declined, and said he had plenty more. Mr. Sharp here read a paper wrapped round the box of pills, in which their qualities were highly extolled, and were designated "Compound Castor Oil Pills."—Dr. Campbell Brown's certificate was in these terms:—I am of opinion that the said sample is made up entirely of the following ingredients: Rhubarb, aloes, ginger, some kind of pepper, probably cayenne, soap, saccharine matter, resinous matter, and that they contain no castor oil.—Dr. Campbell Brown was then examined: He said he believed there were eight pills in the box sent to him, and he analysed three or four of them, and sent back the certificate produced to Supt. Moss. The principal ingredients of the pills were aloes—in round numbers it would be about one-half aloes; in addition, there was a little rhubarb, cayenne pepper, he thought, cloves, and some aromatic spices of that kind, soapy matter and some saccharine matter, probably Spanish root or something of that sort. He examined those pills for castor oil, and there was no appreciable quantity of castor oil in them. He did not mean to say that if he had analysed 1lb. of pills he might not have found a trace of castor oil, but it would not be sufficient to be appreciable in three pills, much less in one, and practically there was no castor oil in them. Aloes is not such a safe medicine as castor oil, because that is an aperient medicine which can be given safely in delicate cases. Persons recovering from fever and inflammation, and so on, are always ordered castor oil; and aloes to such people would be an injurious medicine, because of its violent action upon the lower bowels; it would be an injurious medicine in other cases also. Many people cannot take aloes, and they know it. Some females, and also people suffering from piles, would be injured by aloes. Those pills did not answer the description of "Compound Castor Oil Pills?" They are compound aloes pills. They might be called compound rhubarb pills, but the principal ingredient being aloes, they ought to be called compound aloes pills—or at least I will not go so far as that, but the label ought to state that they contained aloes. Cross-examined, Dr. Brown said: I am of opinion that the pills contain no castor oil, but if you say castor oil was used in making up the compound I will believe you. If it is used to the extent of 1·5 or 1·75 per cent. in each pill, I should call that nothing whatever. I am quite sure there was not 5 per cent. If you say there was 1·5 or 1·75 per cent. in each pill, that would be something like ·02 of a grain, and if it was only to the extent of ·02 of a grain in each pill there is no test I know of by which it could be discovered. If I had had two or three pounds of pills I might have extracted sufficient castor oil to be recognised. If it was distinctly stated on the label that the pills contained aloes a great deal of my objection would be removed. He had heard of pills made by a certain firm and sold at 1s. 1½d. per box as castor oil pills; if they are protected by the Government three-halfpenny stamp, it only proves that the Government stamp is made the means of covering a good deal of injurious sale of drugs. There have been similar cases to this one brought forward in which there have been convictions. Respectable druggists refuse to sell anything under the name of "Castor Oil Pills;" they sell castor oil capsules.—Mr. Byrom having addressed the Bench for the defendants, Dr. Page, of Kendal, was examined, and said he had examined the specifications of the pills named, and found they contained only a slight amount of castor oil. In the absence of a division of the contents of the box purchased, he was bound to admit that the ingredients mentioned by Dr. Brown were found by him. The whole of the ingredients were such as were given by authority of the Medical Council, as ingredients all of which were in daily use for the relief of constipation and those ingredients were not supposed to have any "specific" effect. They were, in his opinion, non-injurious. He considered that the name "Compound Castor Oil Pills" was justifiable. It was named in accordance with the principles

of pharmacy, and it was also properly named on the ground that it was the usage of pharmacy to name a pill after any ingredient irrespectively of the active quality of the ingredient or the quality. Mr. Collins, analytical chemist, of Bolton, said he had long known there were such things as castor oil pills sold. He supposed they would contain castor oil; in some cases a very trifling quantity and in others a mere trace. He presumed they arrived at their present name owing to their giving similar results as a dose of castor oil. He believed a firm at Leeds were the first makers of those pills. If they relied on the pills to get as much castor oil as went to a dose, they would have to take from 400 to 600. He could not say anything as to the effect of the pills as he was not a medical man, and where doctors disagreed it was sometimes unpleasant to interfere. Castor oil was quoted in that morning's paper at 8½d. per lb., the other drugs were much more expensive. There could therefore be no idea of fraud, otherwise the largest quantity would be used of the cheapest drugs. Cross-examined: he had examined a great many of these pills, and as rule he found them to contain castor oil. He analysed from 20 to 30 pills. He found 1.35 per cent. of castor oil. If he had had two or three pills only he could not have found castor oil. After a brief consultation, the Chairman announced that the Bench were of opinion that there must be a conviction. The penalty would be 40s. and £8 5s. 4d. costs. Mr. Byrom gave notice of appeal, which, we have been informed, has since been abandoned.

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#### NOTES OF THE MONTH.

We do not envy the position of the gentlemen who may be appointed on the Select Committee of the House of Commons on the new Sale of Food and Drugs' Amendment Bill, for already there are signs that they will be flooded with crochets from every direction. The trade societies are already moving, and will do all they can to get knowing little clauses introduced, to further hamper the working of the Act, under the pretence of the protection of innocent traders, while, on the other hand, the medical men and others, who know the danger of impure food and drink, will be doing their best to extend its provisions.

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Already signs of the latter movement are apparent in the action of the British Medical Association, who desire to see water included in the Bill. As a body the analysts are quite ready and willing to accept this extra duty, provided the fee for a sanitary analysis of water be fixed at £1 1s.; but it would be impossible for any man to honestly give a report on any water for the present Act fee of 10s. 6d., as it would not meet his expenses, and even the proposed £1 1s. would only be remunerative in cases where the analyst receives a salary in addition to the fees.

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Among the trade movements we specially find that of the Chemists' Defence Association, who desire to force vendors to have a sample whether they will or not, and further to give the defendant power to always insist on the personal attendance of the analyst in court, instead of, as at present, accepting the certificate as evidence, unless in disputed cases. To the first proposition we have nothing to say, because it makes no difference to us whether a sample be left or not, as there is always the official sample in the hands of the inspector to check such cases of tampering with the tradesman's sample, as have already occurred. But we trust that our Legislature will pause before they lay down the rule that the analyst is to be dragged, perhaps many miles, to court in every petty case, merely so that it may give him inconvenience, and cost the authorities his court fees and travelling expenses. Already there is the most ample provision for the citing of the analyst in any disputed case, and, indeed, under such circumstances, a man whose work was attacked would only be too anxious to come forward in his own defence. To insist upon the continual production of the analyst will be to put another break on the wheels of the Act, and another charge on the public purse, both of which are sufficiently clogged and taxed respectively as it now stands.

The real fact is that the Act, as it stands, is good enough, provided its wording be made a little clearer to remove the "prejudice to purchaser" difficulty, and above all that definite standards be fixed for all disputed articles. It is on the point of names and standards that nearly all the failures of prosecutions have occurred, and the position of analysts is simply this:—They say fix what standards you like, be they high or be they low, but either at once give us standards like those *proposed* to be provided for spirits, or appoint some central authority, say for instance the Council of the Society of Public Analysts, to provide such standards, which when duly approved by the Privy Council, shall become bye-laws under the Act, and so binding on everyone concerned. There is no branch of trade where definite standards and names are more wanted than in the drug business. These traders pretend to use the British Pharmacopœia, but whenever it suits their purposes of defence overboard goes that authority, and "custom of trade" reigns supreme.

In a letter we publish Mr. Angell's vindication, upon which we offer no more remarks, as we wish to avoid internal dissensions. We made our comments, because it appeared there must be some screw loose where a tradesman was prosecuted for what had already been held to be no adulteration. We are particularly sensitive on this point, owing to the readiness with which our natural enemies, the trade journals, would seize it, to be a ground of abuse upon analysts generally.

Mr. J. Carter Bell has been appointed public analyst for the borough of Glossop, vice Allen resigned.

Mr. Francis Vacher has been appointed public analyst for the borough of Birkenhead.

Dr. Bostock Hill has been appointed public analyst for Leamington, vice Dr. Thompson resigned.

Mr. J. Vincent Taylor has been appointed public analyst for Colchester.

Mr. J. Baynes has been appointed public analyst for South Lincolnshire.

#### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price
3008	F. M. Lyte... ..	Purification of Chloride and Sulphate of Zinc ... ..	2d.
3043	J. Duncan & J. A. R. & B. E. R. Newlands... ..	Treatment of Sugar ... ..	4d.
3049	Ditto ... ..	Treatment of Saccharine Substances or Compounds ... ..	4d.
3079	J. Mactear ... ..	Manufacture of Soda and Potash... ..	4d.
3125	W. R. Lake... ..	Apparatus for Concentration of Sulphuric Acid ... ..	2d.
3166	H. Brunner... ..	Manufacture of Alkali ... ..	4d.
3182	R. Lavender & J. Richards ... ..	Treating Waste Sulphuric Acid ... ..	4d.
3228	E. G. Brewer ... ..	Apparatus for Manufacture of Hydrogen Gas ... ..	2d.
3246	C. F. Clans ... ..	Manufacture of Sulphide of Zinc... ..	4d.
3257	F. C. Hills ... ..	Manufacture of Sulphate of Ammonia ... ..	4d.
3297	J. Wilkes & T. Johnson ... ..	Purifying or Refining Copper ... ..	4d.

#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Boston Journal of Chemistry; The Dairyman; The American Dairyman; The Practitioner; American New Remedies; Proceedings of the American Chemical Society; Our Domestic Poisons, by Henry Carr, M. Inst. C.E.; The Hygiene of the Skin, by J. L. Milton; Le Praticien.

Mr. E. W. T. Jones' letter on the question of butter analysis reached us too late for insertion in this number.

ERRATA.—In Mr. Collins' letter in our last number, line 15 the figures should read "Then 9·37—(2·9+3·1+·57)=2·8."

# THE ANALYST.

SUPPLEMENT, APRIL, 1879.

## PREJUDICE TO PURCHASER QUESTION.

SPECIAL REPORT of the Arguments and Judgment, in the case of *Hoyle v. Hitchman*, on appeal from the decision of Sir James Ingham, (see *THE ANALYST*, vol. 3, pp. 368 and 386.)

### QUEEN'S BENCH DIVISION.

*(Sittings in Banco, before Mr. Justice Mellor and Mr. Justice Lush.*

HOYLE APPELLANT—HITCHMAN RESPONDENT.

MARCH 27TH.

This was an adulteration case, which raised a very important question. It was an appeal by an inspector of nuisances against a decision of the magistrate dismissing a complaint against a milkman for adulteration under the Adulteration Act of 1875, and the object of the appeal was to raise the question whether, where, as in almost all cases where officers make such complaints, they have purchased, not for their own consumption, but for the purpose of analysis and prosecution, the complaint is to be deemed to fail on the ground that he is not "prejudiced" within the terms of the Act. The case was sent to this Court in order to obtain a decision on this question which has for some time perplexed the magistracy, and practically interfered with the enforcement of the Adulteration Act—a question arising out of the introduction into the Act of 1875, of words which require that the sale of the adulterated article shall be "to the prejudice of the purchaser." The enactment, as Mr. Justice Lush observed in his judgment in this case, "has given rise to a division of judicial opinion which has, it is to be feared, very much crippled the operation of this most useful Act." Seven of the Scotch Judges in a case of a sale of cream had been divided in opinion, several of them holding that the words referred to excluded cases in which the purchase was made by a public officer—a view which practically would exclude most cases from the operation of the Act, as most prosecutions are initiated by public officers; and on that very ground—that such a view would virtually nullify the operation of the Act—most of the Scotch Judges in that case dissented from it, and though a majority (five out of seven) came to a conclusion adverse to the prosecution, two at last went upon other grounds, so that, as two dissented altogether, a majority did not adopt the view in question. As, however, the cases in the Scotch Courts are not, of course, reported in this country, and the Scotch Law Reports are not generally accessible, all that was known was that the Scotch Supreme Court had dismissed a prosecution by a public officer, and the impression was that they had done so on the ground that a purchase by a public officer could not be "to the prejudice of the purchaser." In a case which came before this Court last year—a mustard case, in which also the purchase was by an officer—the question as to the effect of those words came before this Court not only in that way, but also in this way—that it was set up as a defence that it was very well known that mustard was mixed with flour and other things, so that the purchase could not be to the "prejudice of the purchaser;" and though on the former point one of the Judges (Mr. Justice Lush) expressed an opinion that it was not material that the sale was to an officer, on the second point, which equally involved the meaning of the words in question, the Court sent the case down to be re-stated; and as it was impossible to deny that it was commonly known that mustard was mixed and adulterated, the case never came up again before the Court, and the view taken by the Court was probably fatal to the prosecution. The question again came before this Court, on both points, in a case of "*Sandys v. Small*," June 26, 1878, heard before the Lord Chief Justice and Mr. Justice Mellor. There the case was a sale to an inspector of whisky alleged to have



been mixed with water, and the defence set up was that it was known to be so mixed, and so was not a sale "to the prejudice of the purchaser," and the Court so held; and as they were against the prosecution on that point it was not necessary to decide the other, though the two points were shown to be closely connected in the course of the arguments, for it was pointed out that in most cases purchases for the purposes of prosecution were by public officers, who only made such purchases in cases where they had reason to believe and did believe that the articles sold were adulterated and were commonly adulterated, and that in such cases the officers did not purchase for consumption, and probably did not consume any part of what they purchased. The Lord Chief Justice was supposed to have said, in answer to that argument, "If the officer does not consume the article, how is he prejudiced?" it being admitted that in such cases the officers do not pay the price out of their own pockets; and, in fact, in that case, as already stated, the decision was that the prosecution failed because the purchaser was "not prejudiced." Whether or not the observation of the Lord Chief Justice had anything to do with the decision, it certainly has since received the sanction of a considerable weight of judicial authority, for in a case of "Davidson v. M'Leod" some of the Judges of the High Court, after a second argument, arrived at the same conclusion—that where the officer, not purchasing for his own consumption, has not been actually prejudiced, the case must be considered to fail. Thus the impression was produced on the minds of the magistracy that this Court, as well as the Scotch Court, had held again and again that the sale must be "to the prejudice of the purchaser" personally, and that if he neither paid for nor consumed the articles purchased, it could not be said that he was "prejudiced"; and in consequence of this impression many of the magistrates had declined to convict, almost all cases, as already stated, being purchases by public officers. The present case was one of them, and was brought before the Court in order to determine the question, on which it was said the whole operation of the Adulteration Act practically depends, most prosecutions under the Act being instituted by officers, and few of the poorer classes most likely to be imposed upon by adulteration being disposed to incur the necessary expenses of a prosecution. In the present case the question had arisen thus:—1. The respondent Hitchman was summoned on the complaint of Hoyle, an inspector under the Sale of Food Act, 1875 (38 and 39 Vict. cap. 63), for that he "on the 13th of September, 1878, within the Metropolitan Police District, did sell to the prejudice of the said John Hoyle, a certain article of food—to wit, milk, which was not of the nature, substance, and quality of the article demanded by the said John Hoyle, contrary to the statute 38 and 39 Vic., cap. 63. 2. On the 4th day of October last the case was heard by me, Sir James Ingham, the chief magistrate of the police-courts of the metropolis. 3. The appellant was the inspector of nuisances of the Board of Works for the St. Giles's district, in the county of Middlesex, and was also the inspector duly appointed under the 13th section of the Sale of Food and Drugs' Act, 1875. He went on the 13th of September last to the respondent's shop and asked for half-a-pint of milk, and upon being told that the price was 1½d., he paid that sum out of money belonging to the said Board, for which he had to account, and took possession of the milk. Directly after the purchase was so completed, he told the respondent's shopman that he was an inspector of nuisances, and an inspector under the Sale of Food and Drugs' Act, 1875, and that it was his intention to have the milk analyzed by the public analyst, whom he named. 4. He then offered to divide the milk into three parts, and did, in fact, so divide it, and sealed up such parts as required by the Act. One part he delivered to the shopman, and the remaining two parts he took away with him and delivered one of them to Dr. Redwood, the public analyst, and produced the third part before me on the hearing of the case. 5. The milk so purchased was found by the public analyst to contain 76 parts milk, and 24 parts water, which water had been added to the milk after it came from the cow. 6. On cross-examination by the respondent, the appellant stated that he was not prejudiced, and that no injury had been done to him personally. 7. The respondent submitted to me that no offence had been established under the 6th section of the Act, as the milk sold was not sold to the prejudice of the purchaser. 8. I found that the appellant demanded milk; that the article sold was not of the nature, substance, and quality of the article demanded, as it was, in fact, milk and water, and not milk; that the appellant at the time when he purchased the milk had no knowledge as to whether the milk which the respondent sold to him was adulterated or not; that no notice of any kind was given to him that the article sold was milk and water and not milk. Had the purchase in this case been by one of the ordinary customers of the respondent, the offence mentioned in the Act, would, in my judgment, have been committed. 9. I, however, dismissed the summons, because I thought that, although the appellant did not get the article he paid for, the sale was not, in the circumstances mentioned, a sale to the prejudice of the purchaser within the meaning of the Act, as the milk was purchased by an inspector for the purpose of analysis only. 10. The appellant duly required me in writing to state a case for the opinion of this honorable Court, which I now do. The question for the opinion of this honorable Court is whether I was right in point of law in dismissing the summons. If I was wrong, I pray this honorable Court to remit the case to me with its opinion thereon, so that I may impose such a fine as, in the circumstances of the case, I may deem just."

Mr. POLAND, for the appellant, argued that if a complaint otherwise well grounded could be dismissed

on such a ground, the Act would be virtually nugatory, as no one but a public officer was likely to buy a pennyworth of milk for the purpose of analysis. No doubt the words were introduced into the Act, "to the prejudice of the purchaser;" but the only effect was to exclude a case in which the mixture was not to the prejudice of the purchaser.

Mr. Justice LUSH pointed out section 13, providing that inspectors might purchase articles for the purpose of analysis, and several subsequent sections providing for prosecutions by inspectors.

Mr. MORTON SMITH, in support of the magistrate's decision, said it had proceeded upon the authority of the observations of the Lord Chief Justice in the case in this court, and also the decision of the Court of Sessions in Scotland in a similar case to the present, in which five out of seven Judges reversed the conviction. But it appeared that there it was not alleged that it was "to the prejudice of the purchaser;" nor could it be, the article purchased having been cream, and the purchaser having got cream, though of an inferior quality.

Mr. Justice LUSH referred to the regular law report of the case in this Court, whence it appeared that in that case the article was known by the purchaser to be mixed.

Mr. Justice MELLOR observed that the view taken by the magistrate seemed to make nothing of the provisions in the Act for purchases of articles for analysis by officers and inspectors.

It was answered that these provisions were confined to cases of adulteration not injurious to the public health; but

Mr. Justice LUSH said he could not so read the Act. The effect of the words "to the prejudice of the purchaser" was only to require that the article should be deteriorated by the mixture. According to the contrary view, any benevolent person purchasing a quantity of arrowroot or other nutritive article for the sick might be imposed upon by adulteration to any extent with impunity, for the purchaser not himself using the article would not be prejudiced, and those who were prejudiced were not the purchasers. That was the way in which to undermine the operation of the most useful Act of Parliament.

Mr. POLAND, in reply, referred to the report of the case in this Court in the 47th "Law Journal." He also cited the case of "Sandys v. Markham," 41 "Justice of the Peace," p. 52, (January 27, 1877), the "mustard case," where the objection was taken that the purchaser, an officer, purchased only for analysis, and also that mustard was known commonly to be adulterated, and the case was sent back to the magistrate to be re-stated on the latter point, but Mr. Justice Lush expressed an opinion adverse to the first objection. The case never came before the Court again. No case in this country had decided that if the adulteration was shown, it was a defence that the purchaser did not purchase for his own consumption. As to the Scotch case, two of the Judges dissented, and the other five differed a good deal in their grounds and reasons; and that, moreover, was not a case of adulteration, but simply a case of poor cream.

Mr. Justice LUSH observed that it might be that the decision was quite right, and also quite consistent with a different decision of the present case.

Mr. POLAND said that was so, and proceeded from the report to point out that at least two Judges out of the five went on that ground; and as two dissented from the decision, it followed that only three out of the seven rested their decision on the words "to the prejudice of the purchaser," and the majority of the Judges were adverse to the view of the words now suggested. Moreover, the decision partly rested on the ground that it was not alleged that the purchaser was prejudiced, and that he could not have been, as he asked for "cream," and got it.

Mr. Justice MELLOR.—You do not, therefore, contest the decision? Mr. POLAND.—No, nor the opinions of the majority of the Judges.

Mr. Justice LUSH.—There was no admixture of foreign matter in the cream in that case. Mr. POLAND.—No.

Mr. Justice LUSH.—It was only a case of poor cream. Devonshire cream is richer than the cream furnished by the cows in other counties. I dare say Mr. Morgan Lloyd will not be offended if I venture to suggest that Alderney cows may furnish richer milk than Welsh cows. Mr. MORGAN LLOYD.—My Lords, no doubt there are cows and cows in Wales as in other countries.

Mr. Justice MELLOR said in the Scotch case there was no mixture of foreign matter with the cream, and he saw no ground for dissenting from the actual decision in that case, however he might dissent from the reasons given by some of the Judges. However, the Court felt it was due to the Scotch Judges to pay them the respect of carefully reading and considering their judgments, and, therefore, the Court would take time to consider their judgment.

### MARCH 28TH.

Mr. Justice MELLOR, in giving his judgment, having read the enactment and stated the effect of the case, said,—The only ground on which the magistrate had dismissed the complaint was that the purchaser was not "prejudiced" by the sale of the milk to him. That gives rise to the question whether the "prejudice" contemplated by the 6th section is a pecuniary prejudice. Such a view of the Act would, in

my judgment, absolutely nullify its beneficial effect. For if the meaning of the enactment is that the offence cannot be complete without its being "to the prejudice of the purchaser," it is hardly possible that the offence should be brought home to any one. And this observation, in my view, goes far to show that this construction cannot be the right one. So far as authority is concerned, there is no direct decision in favour of such a view; and indeed, in the English Courts, there is hardly any authority upon the point. For in the first of the two cases in this Court referred to, the mustard case, my brother Lush, distinctly said that, in his view, if the article were adulterated, it must be presumed that it was "to the prejudice of the purchaser," and I could not have dissented from that opinion or I could not have concurred in sending the case down to be re-stated on the other point. And as to the other case, no doubt in the course of the argument the Lord Chief Justice made some such remark, but not by way of a decided *dictum*, and rather by way of query or suggestion, and the decision went upon the other point, so that there is no authority in the English Courts in favour of the view now presented. There is, however, the decision of the Court of Session in Scotland, and if the Judges had concurred in that view we should have been reluctant to give a decision contrary to their judgment. But, out of seven Judges, two of them dissented from the decision altogether, and two more appear to have declined to adopt this view, so that the majority of the Court do not appear to have adopted the view now presented to us, and (if I may presume to say so) I am not prepared to say that their actual decision upon the case before them was erroneous; indeed, the inclination of my mind is to go along with the majority of the Scotch Judges in the conclusions they arrived at. But two, at least, even of the majority who concurred in the decision appear to have dissented from the view that pecuniary prejudice to the purchaser is essential to constitute the offence, and one of them said that such a view would nullify the operation of the Act. Therefore, in this diversity of opinion as to the meaning of the words "to the prejudice of the purchaser," it cannot be said that the weight of judicial authority is against, and I rather think it is in favour of, the view which we have arrived at after the best consideration given to the question as to the true construction of the enactment. It is quite general in its terms, and its terms are very large, nor is there anything to limit them,—“if any one shall sell, to the prejudice of the purchaser, any article of food not of the nature, substance, or quality of the article demanded by the purchaser.” There is nothing to limit the application of the enactment (as some of the Scotch judges seem to have supposed) to articles deleterious in their nature. And in several of the sections (13 to 17) provisions are made for purchases by public officers for the purpose of analysis and prosecution, assuming that if the article is found to be adulterated the offence will have been committed. It would be strange indeed if all these provisions were to be made nugatory by a construction which would, in effect, come to this—that proceedings could only be taken by private individuals. Here the purchase was made by the inspector under those sections; but surely the case must be treated as though the purchase had been by a private individual. Now, in the case of a private individual no one could dispute that in such a case as this the offence would have been completed, and the magistrate has so found, in fact. That being so, what difference can it make as to the nature of the offence that the purchase was by an officer on behalf of the public and furnished with public money for the purpose? If the purchaser asks for a certain article, and gets an article which by reason of some admixture of a foreign article is not of the nature or quality of the article he asks for, he is necessarily "prejudiced;" and how can the fact that the purchase is not with his own money at all affect the question of the commission of the offence? The offence intended to be prevented by the Act was the fraudulent sale of articles adulterated by the admixture of foreign substances which would necessarily be "to the prejudice of the purchaser;" and those words were inserted only to require that such an adulteration should be shown to have been made. Taking all these matters into consideration, I cannot bring my mind to the conclusion that in such a case as this the offence is less complete merely because the money with which the purchase was made was not the money of the purchaser, which must be wholly immaterial to the seller and cannot affect the offence he has committed. I come, therefore, to the conclusion that the magistrate was wrong in dismissing the case on that ground, and, therefore, that the case must be remitted to him to be determined on the evidence as to the offence alleged to have been committed.

Mr. Justice LUSH, in expressing his entire concurrence, said that the differences of opinion which unfortunately prevailed as to the true construction of the 6th section of the Act had crippled the operation of a most beneficial Act.—Judgment for the appellants.

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The Select Committee on the Sale of Food and Drugs' Act (1875) Amendment Bill met on the 28th ult., and appointed Mr. Selater-Booth chairman. The Committee will sit on Tuesday, the 1st instant, at one o'clock.

TABULATED STATEMENT SHOWING THE WORK DONE BY PUBLIC ANALYSTS, UNDER THE SALE OF FOOD AND DRUGS' ACT,  
DURING THE YEAR 1878.

*Compiled specially for THE ANALYST.*

ANALYST FOR	Milk, Butter-milk and Cream	Butter.	Groceries.	Drugs, &c.	Wines, Spirits, and Beer.	Bread and Flour.	Sundries, including Water.	TOTAL.		REMARKS.
								No. Analyzed.	No. Adulterated.	
M. A. ADAMS	Kent	132	22	17	108	11	14	271	33	Three-quarters only.
A. H. ALLEN	Barnsley	—	—	—	—	—	—	—	—	
"	Chesterfield	—	—	—	—	—	—	—	—	
"	Derbyshire, N.	7	4	4	1	11	3	2	2	14
"	Glossop	—	—	—	—	—	—	—	—	
"	Sheffield	28	6	8	2	38	10	—	—	
"	Yorkshire (W.R.)	71	18	9	2	53	8	48	14	54
A. ANGELL	Guildford	9	—	12	1	29	9	8	1	10
"	Hampshire	39	6	21	—	49	11	31	3	48
"	Grantham	1	—	—	—	—	—	—	—	
A. ASHBY	Denbigh County	—	—	—	—	—	—	—	—	
J. J. BANCROFT	Chelsea	41	9	17	2	172	28	—	—	8
A. W. BARCLAY	Hull	37	5	1	—	23	3	—	—	45
J. BAYNES	Yorkshire (E.R.)	38	17	3	1	44	5	7	5	2
J. CARTER BELL	Cheshire and Salford	284	34	16	3	123	15	60	40	348
J. W. BIGGART	Greenock	30	5	—	—	1	—	8	3	103
"	Port Glasgow	—	—	—	—	—	—	—	—	2
"	Oban	—	—	—	—	—	—	—	—	1
T. P. BLUNT	Montgomeryshire	—	—	—	—	—	—	—	—	
"	Salop	—	—	6	—	70	7	—	—	36
"	Wenlock	—	—	—	—	9	3	—	—	12
A. WYNTER BLYTH	Devon	11	4	6	—	32	4	—	—	3
J. BRERLEY	Southampton	35	23	18	5	—	—	—	—	12
J. CAMPBELL BROWN	Blackburn	64	11	—	—	—	—	—	—	3
"	Lancaster (Borough)	—	—	—	—	—	—	—	—	4
"	Lancaster (County)	313	62	12	2	85	18	2	1	215
"	Liverpool	136	37	11	3	88	69	9	2	19
"	Preston	14	4	—	—	—	—	7	3	—
G. A. CAMERON	Carlow (County)	—	—	—	—	—	—	—	—	3
"	Cavan	—	—	—	—	—	—	—	—	8
"	Clare	40	4	—	—	54	2	—	—	17
"	Down	25	15	—	—	20	—	—	—	25
"	Drogheda (Town)	30	1	—	—	—	—	—	—	5
"	Dublin (City)	1230	35	20	1	105	5	6	1	4
"	(County)	105	15	—	—	1	1	2	—	6
"	Fermanagh (County)	10	5	—	—	—	—	—	—	3
"	Galway	9	7	—	—	—	—	—	—	—
"	Kerry (County)	24	9	—	—	14	3	—	—	4
"	Kildare	11	4	—	—	—	—	—	—	—
"	Kilkenny (City & County)	30	6	—	—	5	2*	—	—	7
"	Leitrim (County)	9	4	—	—	—	—	—	—	1
"	Limerick (City)	33	3	—	—	—	—	—	—	1
"	(County)	35	5	—	—	1	—	—	—	1
"	Longford	5	3	—	—	—	—	—	—	2
"	Mayo	42	25	—	—	2	—	—	—	18
"	Meath	9	3	—	—	—	—	—	—	3
"	Queen's	1	1	—	—	—	—	—	—	4
"	Roscommon	40	18	—	—	—	—	—	—	—
"	Sligo	17	2	—	—	6	3	—	—	10
"	Tipperary	25	4	—	—	1	—	—	—	10
"	Waterford (City)	—	—	—	—	—	—	—	—	3
"	(County)	5	2	—	—	—	—	—	—	—
"	Westmeath	1	1	—	—	—	—	—	—	17
"	Wexford	1	1	—	—	—	—	—	—	6
"	Wicklow	6	6	—	—	—	—	—	—	13
J. CLARK	Dumbarton	—	—	—	—	—	—	—	—	24
"	Helmsburgh	—	—	—	—	—	—	—	—	—
"	Paisley	—	—	—	—	—	—	—	—	—
J. H. COLLINS	Cornwall	4	2	—	—	—	—	—	—	6
"	Penzance	—	—	1	—	—	—	—	—	2
"	Mile End Old Town	6	1	—	—	—	—	—	—	—
W. G. CROOK	Norwich	55	17	18	2	22	—	—	—	18
A. DUPRE	Westminster	158	29	27	3	132	9	7	7	87
A. J. EDEY	Durham	12	1	6	—	12	2	5	—	6
"	Gateshead	—	—	—	—	—	—	—	—	4
C. ESTCOURT	Ashton-under-Lyne	—	—	—	—	—	—	—	—	3
"	Macclesfield	—	—	—	—	—	—	—	—	3
"	Manchester	43	8	—	—	26	1	2	—	27
T. FAIRLEY	Leeds	25	1	5	—	6	—	—	—	4
"	Pontefract	—	—	—	—	—	—	—	—	7
"	Wakefield	—	—	—	—	—	—	—	—	2
"	Yorkshire (N.R.)	11	—	1	—	30	4	1	1	7
J. W. GATHOUSE	Bath	84	9	—	—	13	—	—	—	18
H. GOODE	Derby (Borough)	10	—	—	—	—	—	—	—	8
"	(S.) (County)	3	1	—	—	9	—	—	—	1
J. H. GRAMSHAW	Gravesend	—	—	—	—	—	—	—	—	15
W. M. HAMLET	King's Lynn	—	—	—	—	—	—	—	—	6
C. HARRISON	Lincoln	6	—	—	—	1	—	—	—	3
S. HARVEY	Canterbury	3	—	—	—	—	—	—	—	—
"	Deal	—	—	—	—	—	—	—	—	5
"	Faversham	—	—	—	—	—	—	—	—	—
"	Folkestone	15	5	—	—	—	—	—	—	—
"	Margate	—	—	—	—	—	—	—	—	—
"	Sandwich	—	—	—	—	—	—	—	—	—
C. W. HEATON	St. Martin's-in-the-Fields	4	—	—	—	6	—	—	—	7
O. HEHNER	Ryde	7	7	1	—	3	2	—	—	8
"	Isle of Wight	7	—	3	—	9	2	9	—	1
C. HEISCH	Lewisham	45	14	8	1	6	1	3	—	4
"	St. John's, Hampstead	14	3	2	—	24	11	5	—	6
ALFRED HILL	Birmingham	40	26	—	—	60	6	—	—	35
A. BOSTOCK HILL	Stratford-on-Avon	—	—	—	—	—	—	—	—	5
"	Warwick (Borough)	—	—	—	—	—	—	—	—	10
"	(County)	12	6	—	—	51	14	2	1	3
J. F. HODGES	Antrim (County)	—	—	—	—	—	—	—	—	1
"	Belfast (Borough)	—	—	—	—	—	—	—	—	11
"	Donegal (County)	—	—	—	—	—	—	—	—	7
"	Tyrone (County)	—	—	—	—	—	—	—	—	—
J. HORSLEY	Gloucester (City)	—	—	—	—	—	—	—	—	—
"	(County)	—	—	—	—	—	—	—	—	—
"	Hereford (County)	—	—	—	—	—	—	—	—	—
J. JARMAN	Halifax	19	1	4	—	7	1	7	6	3
"	Huddersfield	24	9	7	1	7	3	1	22	8
E. W. T. JONES	Kidderminster	—	—	—	—	—	—	—	—	—
"	Lichfield	6	2	—	—	—	—	—	—	6
"	Staffordshire	271	74	25	1	454	58	14	8	21
"	Walsall	4	3	—	—	2	1	—	—	4
"	Wolverhampton	17	4	3	—	14	3	—	—	7
J. FALCONER KING	Edinburgh	6	5	—	—	4	2	1	—	1
J. WEST KNIGHTS	Cambridge	7	1	—	—	1	—	—	—	2
"	Ely	5	3	—	—	—	—	—	—	4
"	Huntingdon	—	—	—	—	—	—	—	—	1
J. R. LEEBODY	Londonderry (City)	17	4	—	—	4	—	—	—	3
"	(County)	3	1	—	—	—	—	—	—	1
R. McCALLEY	Falkirk	—	—	—	—	—	—	—	—	—
"	Stirling	7	—	—	—	—	—	—	—	—
J. M. MILNE	Airdrie	—	—	—	—	—	—	—	—	—
"	Fife	—	—	—	—	—	—	—	—	—
"	Stewarton	2	1	—	—	—	—	—	—	—
J. W. MONTGOMERY	Cumberland	6	1	—	—	4	—	—	—	33
E. H. MOORE	Brighton	—	—	—	—	—	—	—	—	28
W. MORGAN	Brecon (City and County)	—	—	—	—	—	—	—	—	3
"	Cardigan	2	—	2	—	14	7	—	—	4
"	Carmarthen (Borough)	12	4	—	—	—	—	—	—	4
"	(County)	6	—	1	—	12	2	—	—	8
"	Swansea	116	7	9	1	91	6	2	—	16
J. MUTER	Bermondsey	14	6	11	5	15	2	1	—	11
"	Lambeth	64	10	—	—	134	9	—	—	12
"	Rotherhithe	24	3	4	2	—	—	—	—	10
"	St. George, Southwark	17	4	8	4	7	—	—	—	7
"	Tenterden	—	—	—	—	—	—	—	—	1
"	Wandsworth	87	9	37	7	167	4	7	—	48
J. NAPIER	W. Suffolk	—	—	—	—	—	—	—	—	27
C. O'KEEFE	Cork	152	15	—	—	1	—	—	—	2
W. PEARCE	Maidenhead	—	—	—	—	—	—	—	—	1
F. PERKINS	Exeter	2	1	4	2	—	—	—	—	19
W. PROCTER	Beverley	—	—	—	—	—	—	—	—	4
R. A. RIDOUT	Monmouth	—	—	—						

# THE ANALYST.

MAY, 1879.

## THE SALE OF FOOD AND DRUGS ACT.

THE recent decision of the Queen's Bench Division of the High Court of Justice, in the case of *Hoyle v. Hitchman*, was given at such a late date that we could not comment upon it, although we published the judgment itself and a considerable portion of the arguments in the special supplement which was issued with our last number.

It is fitting, therefore, that we should now make a few remarks upon a decision, which, as the *Times* says, "has laid a troublesome phantasm which was disturbing the operation of a very useful statute," although we, no less than the *Times*, "are grateful." We have uniformly expressed the opinion that this was the decision the Court of Queen's Bench would arrive at, and it is the more satisfactory to know that it was given not merely on the particular case at issue, (which was one of adulterated milk containing 25 per cent. of water); but that previous judicial remarks and so called decisions were fully reviewed and referred to in the judgment. Some of the remarks made by Mr. Justice Mellor are of such importance that it is worth while to draw special attention to them: he said, "if the meaning of the enactment is that the offence cannot be completed without its being to the prejudice of the purchaser, it is hardly possible that the offence should be brought home to anyone;" and further, "it would be strange, indeed, if all these provisions were to be made nugatory by a construction which would in effect come to this—that proceedings could only be taken by private individuals;" and again, "I cannot bring my mind to the conclusion that in such a case as this the offence is less complete merely because the money with which the purchase was made was not the money of the purchaser, which must be wholly immaterial to the seller, and cannot affect the offence he has committed."

The judgment, therefore, is given entirely on the broad ground that if the decision of Sir James Ingham were allowed to stand, the Act would be rendered entirely inoperative, which certainly was not the intention of the legislature at the time the Act was passed. Mr. Justice Mellor, in his judgment, also points out one thing on which no special stress had been previously laid, viz., that in the Court of Sessions in Scotland, out of seven judges two dissented altogether from the well-known decision, and two others appear to have declined to adopt the view of the remaining three in reference to the "prejudice" question, so that the majority of the Scotch Court was actually of the same opinion as Justices Mellor and Lush.

The introduction of an Amending Bill into the House of Commons, and its reference to a Select Committee, affords us a suitable opportunity to refer to two or three other points in connection with the working of the Act. We have often pointed out before that defences to prosecutions, under the Sale of Food Act, very frequently take the form of detecting flaws of some sort or other in the Act itself. When a man is charged with a misdemeanour of an ordinary kind, the ingenuity of his professional advisers naturally takes advantage of every opportunity of proving him technically innocent rather than guilty; but it is somewhat unusual to find the actual meaning, or intention, or scope of an Act of Parliament challenged, unless the prosecution is taking place under the Sale of Food Act. Yet anyone who would take the trouble, as

we have, to examine the records of disputed cases during the last four years, would be struck with the fact that in a very large number of cases the defence has been,—not that the analysis was incorrect—*not* that the sample had been purchased from any other shop—*not* that the inspector had tampered with it; but in some ingenious way seeking to prove that the prescribed formalities of dividing, labelling, sealing, and so on, had not been fully complied with. Some of the trade journals who have adopted a virulent tone towards Public Analysts generally, say that disputed cases are frequently due to analytical blunders; but it is a singularly significant fact that out of some 50,000 samples examined by Public Analysts during the last four years, only somewhere about one per thousand has been sent to the chemists at Somerset House for a second analysis, and this, notwithstanding the well-known fact that in certain cases, such for instance as milk, those chemists have adopted a standard lower than is justified by the experience of Public Analysts themselves, or by the large number of analyses published by chemists of repute; and it is still more significant that in about half the cases which have actually gone to Somerset House the chemists there have confirmed the results of the Public Analysts, and of the remaining half of the cases their report has frequently been simply equivalent to giving the benefit of the doubt to the vendor—that is, they were unable, owing to the lapse of time or from some other cause, to say whether the sample was adulterated or not.

Such a state of things as this is satisfactory as regards the Analysts themselves, and as regards the Queen's Bench decision; but when viewed in connection with the proceedings taken when the 1875 Act was before parliament, and the character of some of the clauses in the Bill now before the Select Committee, it may have a still more important bearing. It will be in the recollection of most of our readers that when the present Act was introduced into the House of Commons, after the report of the 1874 Select Committee had been presented, a suggestion was made on the part of our Society that a schedule, defining the strength and composition of certain articles, should be introduced into the Act. This schedule was not drawn or put forward with a view to reach any abnormal standard of either quality or purity in the articles referred to in it; but after long consideration and full discussion by members of the Society, it was so arranged as to cover every fair natural variation in the quality of those articles, so that for instance, no genuine milk, derived from a healthy cow, should be condemned under it, while for the same reason the better class of articles, whether milk, or cocoa, or coffee, would allow of some considerable amount of dilution or adulteration before they would reach the limits of the standard fixed. On the other hand an endeavour was made to fix the standard sufficiently high to prevent absolutely reckless sophistication by other means than the mere addition of foreign ingredients, that is, to prevent the produce of starved and diseased cows from being passed off on the public as genuine milk, and it is precisely on such points as these that the schedule to the Act was most needed, and that the so-called protection intended to be afforded by the Inland Revenue Chemists has proved to be worse than useless.

Viewed in the abstract, the proposition of the Society simply amounted to this: that whereas certain substances, as sold, differ slightly in quality even when genuine; and whereas certain tradesmen, less scrupulous than the majority, taking advantage of this fact, were in the habit of reducing the goods they sold still further, that, therefore, this schedule (with any alterations which might be made in it) should be taken to define what was the lowest strength of any substance permitted to be sold as an article of food unless that substance were labelled as a mixture. The adoption of some such

schedule as this, even if the figures suggested by the Society had not been followed in their integrity, would, in our opinion, have rendered the Act much simpler, and it would certainly have obviated all necessity for referring to such a point as the "prejudice of the purchaser," because a minimum strength being given in every case it is practically certain that every shopkeeper would work as nearly as he could to that minimum strength, unless he secured an increased price for an article of better quality. The Act being thus rendered simple and much more effectual, tradesmen, instead of being in doubt as they are now as to what is legal, would have had a certain defined standard to work to, and thus all dispute as to what was and what was not adulteration would have been prevented, because a legal standard having once been fixed there would practically have been no difference between the results obtained by one Analyst and another on any given sample.

However, in 1875, the opinion of the legislature was adverse to any such schedule, and consequently the views of the Society were passed over, and until the introduction of the present Bill, which bears the names of Messrs. Anderson, Taylor, and Whitwell, there has been no attempt to give any schedule of any kind. Now, however, one is introduced relating to articles as to which a standard is specially needed, and from the discussion which took place before the Select Committee to whom the Bill was referred, it seems likely that this partial schedule, as to spirits only, will be adopted. Although the Committee's Report is not published, yet we understand that they will advise that all spirits, except gin, be allowed to be sold at 25 U.P., and gin at 35 U.P. Should this prove to be the case it will be, in more respects than one, a satisfactory step, because it will not only be the first adoption of the principle of definite standards, but it will relieve Public Analysts of a difficulty which has for some time past prevented any satisfactory certificates from being returned in reference to spirits.

But a singular anomaly will yet remain in the Act. Milk is the substance which, after spirits, most requires that a standard should be fixed for it, but here we could scarcely expect at present to meet with uniformity of opinion; without going over old ground, it is notorious that there is a difference of several per cent. between Analysts and the Somerset House Chemists. Our experience, and it is by no means small—since Public Analysts examined during 1878 more than 5,000 samples of milk—goes far to confirm the standard adopted by the Society some years ago, and we believe it is true that Mr. Bell and his coadjutors are gradually seeing their way to raise their figures slowly though steadily to those adopted by the Society.

But leaving this moot point, it certainly seems to us that drugs might fairly have been considered worthy of a place in this Amendment Bill, and that, if a standard were to be fixed for spirits, the Pharmacopœia might also have been taken as a standard for drugs. The subject was mentioned before the Committee, though not by this Society; but we learn that the Committee appear not to see their way at present to accept either the Pharmacopœia or any other standard as being a fit and proper standard for drugs. Therefore, Public Analysts will have to work as hitherto, according to their own judgment, guided by the information given in the Pharmacopœia, and using their discretion in each case as to whether a sample should be returned as adulterated or not. This seems to us specially unfortunate—no less so to the chemists and druggists than to the Analysts, because both are still left in the same position of uncertainty. We cannot at all agree with the opinion expressed by Mr. Bell on this point, when he stated that his objection to the Pharmacopœia as a standard was that every Analyst would use it as a hard and fast line, and that before such a standard as that was taken it ought to be

referred to the Pharmaceutical Society to know if they had anything to say to it. Broadly, this means, if it has any meaning at all, that Mr. Bell thinks that the Pharmaceutical Society, after having put forward the Pharmacopœia for years as their recognised standard, are, now that a proposal is made to test their goods according to it, to be asked first whether they wish to alter their standard. We can scarcely believe such an idea could have entered the minds of the Pharmaceutical Society, but rather that some idea as to the wholesale adulteration of drugs must have been prevailing in Mr. Bell's mind, in reference, for instance, to such drugs as the sulphate of quinine? recently sent to India. We are quite certain that both parties would be in a far better position, with a definite standard laid down, than they are now, in cases in which a drug is found to be short of the Pharmacopœia strength.

We understand that the Committee also recommend that prosecutions should be instituted within twenty-eight days from the purchase of the samples, and also that samples for analysis may be purchased in "open places of public resort," which we suppose may be taken to mean streets and markets, in addition to the shops only which some magistrates have held are the only places at which they may now be purchased.

We cannot give the Bill in its amended form in our present number, but next month we hope to do so, and shall probably have occasion to refer to one or two other points likely to be brought up by it.

### AN ANALYSIS OF COFFEE LEAVES.

By OTTO HEHNER, F.C.S.

*Read before the Society of Public Analysts, on 19th February, 1879.*

A SAMPLE of roasted coffee leaves, analysed by W. Stenhouse (Phil. Mag., 4, vii., 21), contained 1.2 per cent. of theine, 2.1 per cent. of total nitrogen, and yielded 38.8 per cent. of extractive matter, the infusion possessing a taste as of tea and coffee combined.

Having recently had a sample of the slightly roasted leaves, as used in Brisbane, Australia, handed to me, I have examined them with the following results:—

Moisture	..	..	..	..	..	..	..	..	10.29	} Soluble.
Theine	..	..	..	..	..	..	..	..	0.29	
Soluble nitrogenous matter	..	..	..	..	..	..	..	..	5.10	
Soluble mineral salts	..	..	..	..	..	..	..	..	4.95	
Other extractive matter	..	..	..	..	..	..	..	..	19.81	} Insoluble.
Insoluble nitrogenous matter	..	..	..	..	..	..	..	..	13.35	
Cellulose	..	..	..	..	..	..	..	..	34.51	
Chlorophyl, and other insoluble non-nitrogenous substances	..	..	..	..	..	..	..	..	7.83	
Insoluble mineral salts	..	..	..	..	..	..	..	..	3.87	
									100.00	
Total extractive matters	..	..	..	..	..	..	..	..	30.15	
Total ash	..	..	..	..	..	..	..	..	8.32	of which is
Soluble	..	..	..	..	..	..	..	..	3.83	
Insoluble	..	..	..	..	..	..	..	..	4.99	including
Sand	..	..	..	..	..	..	..	..	0.42	
Total nitrogen, by soda lime process	..	..	..	..	..	..	..	..	3.02	per cent.



The infusion contained much caffe-tannic acid, as well as some tannin and glucose, the latter probably derived from the decomposition of the tannin.

The amount of theine found is remarkably small.

The taste of the infusion, if it can be compared with anything, resembles that of a mixture of tea and tobacco, a taste invariably observed, as I was told by my informant, by habitual consumers of the infusion.

The leaves when burnt or roasted exhale a powerful odour of tobacco, and the vapours, when condensed on a glass plate, smell overpoweringly of tobacco juice. It is needless to add that the leaves were carefully examined with the microscope, and that they contained no particle of tobacco. The microscopic structure of the leaves presents nothing very remarkable, but the sheaths of the veins are most regularly undulated. The stomata are small and numerous.

Mr. J. Hughes said that, having lately visited Ceylon, where he saw Mr. Cotton who had sent a sample to one of the societies here, he was much interested in the analysis. Coffee leaves had already been prepared and exhibited with a view, if possible, for future use as a drink; the infusion was something like tea, and under some circumstances might be used as a substitute by persons living in the country. It is rather strong but very refreshing, especially after a long walk or ride.

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#### PROPOSED AMERICAN ADULTERATION BILL.

By DR. MUTER, M.A., F.C.S.

In closing the discussion on the paper on the German Adulteration Bill, which Mr. Hehner read before the Society of Public Analysts on the 19th March last,\* Dr. Muter said: Although I rise to conclude this discussion, I have yet really nothing to say as to the German Bill in addition to what has already been expressed, except to thank Mr. Hehner, in the name of the Society, for a most interesting communication; but, I have brought with me to-night the draft of a proposed law "to prevent the adulteration of food and medicine, and to create a State Board of Health" in the United States of America. This draft is in the form of a report to the Medical Society of the State of New York, and is published as a special supplement to the rising American journal known as *New Remedies*. It appears that for a year back the whole subject has been under consideration by a joint committee made up of representatives from the New York Academy of Sciences, the New York Academy of Medicine, the Medical Society of the County of New York, the Therapeutical Society, New York College of Pharmacy, New York Medico-Legal Society, the Public Health Association, and the American Chemical Society, and considerable time has been devoted to the examination of the subject; and two or three drafts of laws besides this have been prepared and submitted to discussion.

The report opens with critical remarks upon the defects of our "Sale of Food and Drugs Act," and the following is the summary of these weak points:—

First, the law must so clearly define the offence of adulteration in all its various forms, even by repetition in wording the definition where this may be useful, as to make the various forms of the offence plain to the understanding of the persons who

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\* See Analyst, vol. iv., p. 62.

adulterate, rather than by general definitions to leave too much to be decided only by litigation in the courts. If the offence be well defined to the person who adulterates, the first effect will be to prevent or deter him.

Secondly, the questions of intent to defraud, and of injury or prejudice to the purchaser of adulterated articles, either as to health or to cost, are carefully avoided, because in a definite, fully recognized shape they are often entirely wanting in the adulterator, and are always difficult to prove. A very large proportion of the adulterations practised are not attempts at fraud, nor designed to damage health, but are straining efforts to make money. And these efforts are so earnest and so intense, energetic, and absorbing as to leave all other considerations in the background. That the public is hurt and cheated is but an accident rather than a malicious intention. In place of these the adulterator is made responsible for the effects of his acts in their more definite and physical relations to the public; and to the penalties imposed upon them. The offence then consists in the act of debasement, which is so easily proven by the debased article. And a pleading of absence of intent to defraud, or of the harmless character of the debasement to the individual purchaser, would simply amount to a plea of ignorance of the effects of the offence, and would influence the courts—not so much on the question of conviction because the public offence of debasement has been committed—but simply as to the extent to which the adulterator should suffer in order to prevent others from similar acts through similar ignorance.

Thirdly, the making it the duty of the consumer who may be injured to prosecute the offenders (using the inspectors merely as witnesses in the prosecutions) has been carefully avoided, because it has been found that very few persons have either the inclination, time, or money, to give to such prosecutions, and that it is much cheaper for individuals to suffer than to prosecute.

To carry out the law, State Boards of Health are to be constituted, consisting of two physicians, one chemist, one barrister, and one eminent retired merchant, who are to be duly sworn to appoint analysts and inspectors, and carry out prosecutions. The analysts are to be bound to procure and examine ten samples of food and drugs each week, and to meet at stated intervals to discuss processes, and fix standards to be laid before the Board of Health for approval, and when so approved such standards are to be binding. All the reports of the analysts are to go before the Board of Health, and no prosecution is to take place, except by their orders, after consideration of the said reports. The offences are described with almost painful attention to *minutiae*, and with what often savours of apparently vain repetitions. They are as follows:—

1. The adding of one or more substances to another or others whereby the strength, purity, quality, or true value of the resulting substance or mixture is reduced or lowered in its nature or composition with the effect of tending to deceive the public by lowering such substance or mixture from its original and true value, or altering the public significance and common meaning of the name by which it is or was originally known or used.

[Corn meal in flour; chicory, &c., in coffee; terra alba in cream of tartar; foreign substances in powdered opium.]

2. The substitution of one substance for another, either wholly or in part, with the effect of tending to deceive or mislead the public or any part thereof.

[Artificial wines and liquors and mixtures; artificial mustard; powdered colocynth seed for colocynth.]

3. The abstraction of any part of any substance with the effect that the separation shall reduce the value of the substance and thus tend to deceive or mislead by changing the common significance of the name by which, as a whole, the substance was originally applied to its use.

[Cream from milk, partly exhausted coffee, tea and drugs; thymol from oil of thyme.]

4. The application of a name commonly known or understood to indicate any substance, to any part or parts thereof, or to any other substance, with the effect of tending to deceive and mislead.

[Oleomargarine for butter; potato starch for arrowroot; dead oil for carbolic acid.]

5. The presence in any substance of any impurity, or any foreign matter that is either natural or accidental to it, if in unusual proportion.

[Dirt in all food and medicine; metallic salts in canned provisions.]

6. The admixture of different qualities of the same substance with the effect of tending to deception and fraud.

[Damaged wheat in flour; garden rhubarb in medicinal rhubarb.]

7. Any debasement or dilution of any substance whereby it is reduced in intrinsic value and is yet liable to be given, bought, sold, or used as though it was not debased or diluted.

[Diluted milk; diluted vinegar; diluted liquors; diluted medicines.]

8. Any coloring, coating, polishing or powdering or any other alteration in the physical condition or sensible properties of any substance, with or without addition to, or subtraction from it, whereby damage is concealed, or it is made to appear better or greater than it really is, either in quality, weight, or measure; or whereby impurity or defective quality is partially or wholly masked or hidden, with the effect of tending to deceive or mislead.

[Coloring and polishing of green coffees; powdering and coloring of damaged drugs; bread from damaged or mixed flour; "large" bread of short weight.]

9. The giving or selling or offering for sale, or the possession of any adulterated article by any person whose business it is to make or to deal in articles of food or medicine shall be *prima facie* evidence of the offence of adulteration. Provided that it be, and it hereby is declared to be, the sole and entire object and intention of this law to protect the public against deception and fraud in the cost and quality of food and medicine through adulteration. And all the provisions of this law shall be construed and applied in accordance with its sole object, by the rules of common law.

Whether these complicated provisions would work in practice is a grave question, and I am inclined to think that our own law, as it now stands, is both simpler and better. The only point which I consider to be a real improvement is the establishment of a Central Board of Supervision, charged with the fixing and approving of processes and standards previously discussed and recommended by *compulsory* meetings of the analysts, and the ordering or not of prosecutions. Given that in Great Britain, we should then have an excellent law providing protection to the traders against overstrained prosecutions, and to the analysts against charges of incompetency arising through mere differences of opinion.

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SONNENSCHN.—The death is announced at Berlin of the well-known chemist, Professor Sonnenschein. He had only reached the age of sixty-two.

## MILK PRESERVATIVES.

By G. W. WIGNER, F.C.S.

*Read before the Society of Public Analysts, on 30th April, 1879.*

THE trade in milk preservatives appears to have increased of late, the larger number of quack nostrums in use, and the greater extent to which they are advertised, tending to prove that this is the case; but the most convincing proof is to be found in the fact, that the relative proportions of ash and solids not fat in commercial samples of milk sold in London are not so uniform as has been found to be the case in genuine milk, or even so uniform as used to be the case with ordinary samples of milk, whether genuine or watered, as purchased by inspectors. There is therefore a strong inference that as the ash shows a relative increase, mineral matter of some kind has in many cases been purposely added. It is of course highly improbable that this would be added simply for the purpose of increasing either the specific gravity, or the amount of solids not fat; the proportion which could be added for such a purpose would not be sufficient to effect the object sought, and the mineral substances used must be added either as preservatives, or as antiseptics, or must be contained in the form of mineral impurities in common annatto, or some other colouring matter which has been added to the milk.

I have recently examined a few of these colouring matters and preservative fluids, so-called, in order to see what is being used at the present time for the purpose of mixing with milk, and I append a few notes on the results of the analyses.

—'s Extract of Annatto is a very dark-coloured liquid, quite free from suspended matter, sp. gr. 1040. It contains—

Volatile organic matter	..	..	..	..	..	2.79	per cent.
Ash (mineral matter)	..	..	..	..	..	3.95	„
Total solid matter	..	..	..	..	..	6.74	„

The Ash contained Fe, Na, K, Ca, Al, SO<sub>3</sub>, CO<sub>2</sub>, with a trace of NH<sub>3</sub>.

This liquid is sold at 2s. 9d. per pint, and it is evident therefore that it could not pay to use it for the mere purpose of increasing the "solids not fat" in watered milk, while it is equally possible that the large amount of ash may sensibly alter the ratio between solids not fat and ash in a sample of milk to which it has been added for other purposes. Obviously the only use which could be made of it by a dairyman is to give a higher colour to milk, butter and cheese.

—'s Cake Annatto at 4s. 6d. per lb. contains—

Moisture..	..	..	..	..	..	51.2	per cent.
Volatile organic matter	..	..	..	..	..	25.3	„
Ash (mineral matter)..	..	..	..	..	..	23.4	„

A qualitative examination of the ash showed Fe, Na, K, Ca, Mg, SO<sub>3</sub>, PO<sub>3</sub>, Cl, CO<sub>2</sub>.

It will be seen that the relative proportions of ash and volatile organic matter do not materially differ from the Extract of Annatto last referred to, and the results of the qualitative examination are sufficiently similar to render it highly probable that the Cake has been prepared from Extract of Annatto of this class by merely evaporating it to dryness so as to render it more portable. It is clear that this Cake Annatto is a far cheaper material to use for colouring, inasmuch as at 4s. 6d. per pound it possesses about four times the relative colouring power—value for value—that the Extract does. There can, I think, be little question that it has been mixed with foreign mineral matters, and these of course may seriously affect the ash of milk with which it has

been used; it could not, however, be profitably used to increase the amount of total solids, or to diminish the apparent amount of water in milk.

———'s Cream Sweetener is a liquid sold in canisters at 2s. 9d. per pint, and 16s. per gallon. The instructions issued by the manufacturers state that it is to be added in the proportion of one pint to sixteen imperial gallons, or in very hot or thundery weather it is advisable to use a quart to the sixteen gallons. It is expressly stated that it is perfectly free from adulteration, and that it "assists greatly in throwing up the cream, and even increases the percentage." An examination of the fluid shows that it has a sp. gr. of 1070.

Total solids	..	..	..	..	..	..	..	..	12.5 per cent.
Ash (mineral matter)	..	..	..	..	..	..	..	..	4.1 ..

The most noticeable feature is that the Sweetener contains a large proportion of glucose; the ash consists almost entirely of borax and carbonate of soda. Traces of iron are present, but there is no salicylic acid.

It will be seen that in this case the sp. gr. might sometimes cause a sample of milk to give slightly erratic results, and the addition of glucose to milk or sugar is certainly, in my opinion, a fraudulent admixture. But however this may be, it seems scarcely feasible that any dairyman could use such a compound as this, at the advertised price, for the mere purpose of strengthening watered milk. Even if there were the inclination on the part of any dairyman to adulterate in this way, no profit could possibly ensue to him, but only to the makers of such a nostrum.

———'s Pure Antiseptic Powder fully justifies its name, or at any rate the first adjective, for it consists of pure boracic acid; the retail value of boracic acid is about 8d. per lb., and one cannot help pitying the poor milkman who buys this patent medicine at the rate of 1s. per 6-oz. packet. The directions for use are very interesting: 6 oz. is to be dissolved in a gallon of warm water, and each can is to have from  $\frac{1}{2}$  to 1 gill (according to the weather) of the solution to every gallon of milk it contains, and is then to be set aside for the cream to rise. Clearly the makers of this powder are under the impression that dairymen generally want to prepare skimmed milk, instead of to sell the genuine article, as under the Act they are bound to do.

———'s Food Preserver has one merit, or perhaps I should say the proprietors have the merit of being candid, for they coolly say in their advertisement that "if those using it do not object to risk a prosecution under the Adulteration Act, it may be diluted with advantage, as its solution, at the rate of an ounce in a quart of boiling water will give a fluid," &c. This seems to me to be about as clear instructions for adulteration as any I have recently met with. However, this Food Preserver, which is described as a harmless, odourless, colourless, and tasteless powder, and which is sold at the rate of 6d. per ounce packet, or 5s. per pound tin, consists simply and solely of borax. From a list before me I find that the price of borax is about 6d. per pound. I cannot wonder, therefore, that the proprietors find it profitable not only to manufacture, but to advertise such a preparation.

There is another advertisement going the round of the dairy papers of another compound said to have been of immense value in preserving milk, and which the vendors say may be safely used, because it has been certified by medical authorities. This also consists simply of borax.

In conclusion I think Public Analysts would do well to carefully examine the ash of milk for the purpose of detecting borax, or any of these other substances, and then use their judgment as to what future steps should be taken. I think I need hardly say what course I should myself pursue.

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#### SALE OF FOOD AND DRUGS ACT (1875) AMENDMENT BILL.

THIS Bill was considered by the Select Committee on the 22nd April. The members present were—Mr. Selater-Booth, chairman; Mr. Anderson, Viscount Barrington, Mr. Chamberlain, Mr. Isaac, Sir G. Montgomery, Mr. C. S. Read, Mr. P. A. Taylor, and Mr. Whitwell.

The two principal sections of the Bill are—

“In any prosecution under Section 6 of the Sale of Food and Drugs Act, 1875, for selling to the prejudice of the purchaser any article of food, or any drug, which is not of the nature, substance, and quality of the article demanded by such purchaser, it shall be no defence to any such prosecution to allege that the purchaser, having bought only for analysis, was not prejudiced by such sale;” and

“In determining whether an offence has been committed under Section 6 of the said Act by selling to the prejudice of the purchaser, spirits not adulterated otherwise than by the admixture of water, it shall be a good defence to prove that such admixture has not reduced the spirit to any greater degree than 25 per cent. under proof for brandy, whisky, or rum, or 30 per cent. under proof for gin.”

Mr. H. P. Thomas, from the Local Government Board, was first examined, and said he had charge of the Sanitary Department. The reports of all Public Analysts passed through his hands, and he found that 3052 was the total number of samples of spirits examined under the Act during the years 1877-78. The number of samples submitted to Public Analysts in 1878 had decreased in consequence of the decisions with regard to the words “prejudice of the purchaser.” In all the cases, with a few exceptions, the adulteration was with water. The old system of adding oil of vitriol and capsicum to make diluted spirits pass for strong liquor had almost entirely disappeared. Public Analysts differed very much as to what quantity of water constituted adulteration. Proof spirit was about half alcohol and half water: 49·24 per cent. of alcohol, and 50·76 of water.

Mr. Bell, the principal of the Somerset House Laboratory, suggested that 35° under proof should be the standard for gin instead of 30° under proof, as the Bill proposed. Fusel oil in whisky was an impurity, but he would not describe it as an adulterant. The 25 per cent. under proof which was proposed to be allowed with regard to brandy was quite enough to cover the cases designated “fine old brandy.” Where the spirit was kept in the wood for a very long period a label should be used to indicate the diminution of strength.

Replying to a question, Mr. Bell said that in many analytical cases it would take seven or ten days at least to pronounce an opinion.

The room was then cleared, and the Committee, when the public were again admitted, stated that it was not their intention to call any further evidence.

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#### THE ADULTERATION OF FOOD IN CANADA.

THE Official Report on the Adulteration of Food in Canada, forming the Third Supplement to the Report of the Department of Inland Revenue of that province for the year 1878, is, as it was last year, an extremely complete and carefully compiled blue book,

which—although only 819 samples were analysed ; this, however, being a fair proportion to the population—amounts to nearly 70 pages. The summary shows that adulteration is decreasing in Canada under the influence of the Adulteration Act in exactly the same way as we have found it decrease in England, under the administration of the Sale of Food Act. During 1877 a fraction over 50 per cent. of the samples were found adulterated, while during 1878 the percentage fell to 33·3, or exactly one third of the total number examined. There is one peculiar feature in the table, which might well be copied in the summary of the English reports, viz., a column is devoted to articles not returned as adulterated, but their composition is stated by the Analysts, and this shows that they are of doubtful purity. It is very desirable indeed that some such method should be adopted here, so as to enable Analysts to specifically mark cases where the inference is against the purity of the sample, although the evidence may not be sufficient to justify a distinctly adverse report.

Looking through the summary it appears that condiments and flavouring materials are very largely adulterated, the Report itself stating not with things injurious to health, but with things of inferior value ; for instance, we find that 91 per cent. of the samples of allspice were adulterated, and 75 per cent. of the samples of coffee. Out of 80 samples of butter examined, 12—*i.e.*, 15 per cent.—were found to be adulterated, and the Report states that the adulterated samples were, with one exception, found in the possession of market people or small dealers. Canned fruit was found to be adulterated in the proportion of one out of every five, and milk was found to be adulterated in 40 per cent. of the samples. In some cases this adulteration was simply deficiency of fat, but in a considerable number of cases it was water.

The Analysts have been directing special attention to the adulteration of sugar, and especially to the proportions of glucose found to be present in it ; this glucose amounted in one case to as much as 14 per cent. We quite agree that it may be necessary to fix a legal limit above which the presence of glucose should be held to be fraudulent ; but judging from the character of the sugars of low quality put on to this market it does not appear to us at all probable that glucose had been purposely added in any of the cases referred to. It seems far more likely that a similar, although not identical fraud had been carried out by boiling the sugar in such a way as to produce a considerable proportion of glucose in it, so as to change its grain for the purpose of enabling a much larger drawback to be obtained from the Government when the sugar was exported. It is scarcely a feasible thing to mix glucose directly with sugar ; but it is very easy to manufacture glucose in large quantities while the sugar is being concentrated in the pans.

The Report itself is a model of the manner in which adulteration returns should be published by the Government, every sample being separately reported on with the details of the adulteration found, and the whole are tabulated in a convenient form for reference. If our Local Government Board could see their way to tabulate the 50,000 analyses which have been made by the English Analysts during the last four years, the result would be a collection of information which would be of inestimable value to Analysts and tradesmen in future.

In conclusion, we need do no more than point out that, in reference to milk, every

sample analysed by Messrs. Ellis, Edwards, La Rue, and Fraser, has been reported in a tabulated form so as to show the amount of fat, caseine, sugar, ash, and in nearly every case the percentage of water added.

### SEPARATION OF QUININE AND STRYCHNINE.

By B. W. DWARS.\*

When small amounts of strychnine must be estimated in presence of much quinine, it is advisable, according to the author, to remove first the bulk of the quinine, and this is most effectually done by means of ammonium oxalate, quinine oxalate being almost insoluble in excess of that re-agent. The author used the following process for the analysis of a sample of the well-known Citrate of Iron with Quinine and Strychnia, which, as his analysis shows, is not always what it ought to be.

Five grms. were dissolved in a little water, super-saturated with ammonia, and shaken with chloroform. After evaporating the chloroform, and drying the residue at 110° C., there remained .81 gm. = 16.2 per cent. alkaloids. These were now dissolved in 10 c.c. warm water, and a few drops sulph. acid, then neutralized by ammonia and mixed with ammonium oxalate in excess.

After standing for twenty-four hours the quinine oxalate was collected on a weighed filter, the mother liquor still adhering to it removed by gentle pressure, and finally *once* washed with water. After drying at 100° C. it weighed .704 grms., or .618 quinine.

The filtrate and wash water were shaken up with ammonia and chloroform, and the latter yielded on evaporation .1775 grms., consisting of amorphous alkaloid (which ought not to exist in the pure drug), strychnine, and traces only of crystallizable quinine. It was twice treated with 3 c.c. of pure ether, which dissolved the amorphous alkaloid, and left behind .021 grms. of pure strychnine. Only minute traces of strychnine were lost. The final result was as follows:—

Cryst. quinine .. ..	12.36 per cent. = quinine citrate ..	17.66 per cent.
Amorphous quinine ..	3.13 .. = .. ..	4.44
Strychnine .. ..	.42 ..	—
	—————	22.10
	15.91	
Loss .. ..	.29	

So 22.10 per cent. quinine citrate instead of 24 per cent.; and .42 per cent. strychnine instead of 1 per cent.

**DUTIES OF ANALYSTS.**—At the meeting of the Holborn District Board of Works, on April 2, Mr. Walker called the attention of the Board to the fact that during the past three months there had been no complaints whatever in regard to adulterations in the district. He suggested that, instead of paying their Analyst by salary, the Board should give a fee per case. Mr. Mather said they had certainly had no “flaming sensational cases” recently, but at the same time their Analyst had not been idle, as would be seen by the number of samples that had been investigated. He thought it a matter of congratulation that the inhabitants were apparently being supplied with good and wholesome goods. The subject then dropped. Mr. Walker seems to consider that prosecution of the trader rather than protection of the public is the aim of the Sale of Food and Drugs Act.—*Chemist and Druggist*.

\* *Pharmaceutish Weekblad, Jaargang 15th, No. 46.*



## CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

TO THE EDITOR OF "THE ANALYST."

SIR,—As I was not present on the 15th January last, when the discussion took place on my note on the "Influence of Age on the Composition of Butter Fat," I shall be glad to reply by a letter in your columns, more especially as the criticisms were very far from flattering.

Dr. Dupré says it was "unfortunate" I had published two analyses of some of the butters; now I think some of your readers who may have read my three contributions on the subject may not be of the same opinion, and I will try to show why I claim exemption from deserving Dr. Dupré's severe strictures. I think it must be admitted that I clearly show how the figures forming the tables in my first paper were arrived at, the amount of washing, &c., &c., and this paper raised perhaps only two original questions: 1st. Are not the "Insoluble Acids" generally somewhat higher than stated by Dr. Dupré? 2ndly. Did volatility in the air-bath account for the lower results? At any rate, these were the only two points questioned in the discussion, and I most willingly admit that both, *i.e.*, my higher "insoluble acids" and observed volatility were suggested as being accounted for by the extent of the washing; this I doubted at the time, and hence the experiments communicated in my second note, which went against my opinion, and proved the conjectures of my friends correct. Now, it is certainly more gratifying to find one's opinion confirmed, yet I cannot recognise any "great moral courage" in admitting and showing its confutation; but, observe, I simply admit an error of *opinion* as to the *action of further washing*. I by no means accept the extended washing as desirable, leading as it does to an extra loss in the analysis; only about a third of the bodies so extracted being estimated with soda on the factor in use, and my opinion is still what I expressed at the end of my second note, that I consider the analyses in my first paper show the more correct constitution of butter fat than if the washing be extended. The term "insoluble" can only be applied here in a comparative sense to indicate practical insolubility in water: for continual washing will produce continual diminution to some degree. Washing beyond the extent mentioned in my first paper, which gives a total filtrate of about 600 c.c., extracts only about 5 milligrammes per 100 c.c. I therefore think such extended washing is not worth pursuing, especially as it is mainly lost in the analysis by being reckoned on the factor for butyric acid.

The results shown in my third paper of the analyses of the butter fat, after keeping the butters, I say are strictly comparable with the first analyses, being, as there stated, conducted in exactly the same way with the same washing. How then is the table thrown out and made useless, as stated by Dr. Dupré? The exact *modus operandi* is known, the amount of washing is stated, and the effect of extended washing, if any one prefers to pursue it, can be calculated from the second paper.

I have not and do not admit the "insoluble acids" in my first paper to be incorrect, and cannot see Dr. Dupré's authority for stating it.

Respecting the results in my third paper, I will only say that there is no mistake about the irregularity of the character of the changes either as to specific gravity or constitution of the fat as to soluble and insoluble acids.

Yours truly,

Wolverhampton, March 26th, 1879.

E. W. T. JONES.

TO THE EDITOR OF "THE ANALYST."

SIR,—The following notes on the permanganate process of Professor Tidy may be welcome to some of your readers:—

A permanganate solution was prepared in accordance with his directions on the 3rd of last March; a large clean crystal of hyposulphite was selected, powdered, dried in blotting paper, and the necessary quantity weighed off for the standard solution; 54 septems were required to destroy the blue colour of the iodine in the experiment conducted at the commencement of the three hours; exactly the same quantity was requisite after one hour, and after three hours. The flasks were in moderate daylight. Repeated experiments have since shown, that under these circumstances, no change whatever takes place in the weak acidified solution of permanganate in distilled water during the period required for one of Tidy's determinations.

On the 20th of March the same solution of permanganate was titrated for another purpose, with freshly prepared decinormal oxalic acid; ten grain measures, very carefully taken, required 8.2 c.c. of permanganate.

On the 28th of March the solution was again titrated with "hypo." selected, powdered, and dried as before; 53 septems of hypo. solution were required.

On the 10th of April (this morning) the solution was again examined as before, with both "hypo." and decinormal oxalic acid; 53 septems of hypo. solution were required for the 20 septems taken as usual, and ten grain measures of the oxalic acid were oxidized by 8.3 c.c. The "hypo." was in each case taken from the same batch.

It would appear, therefore, that a solution of permanganate of Tidy's strength can be depended upon for at least a month, at the average temperature of a laboratory in the spring (from 40° to 55° F.). It should be mentioned that the solution which forms the subject of this letter was jealously excluded from the light, and I am of opinion that the commonly accepted idea of the extreme instability of weak permanganate solutions is to be traced to a neglect of this precaution.

Since the appearance of Professor Tidy's paper I have been in the habit of working water analyses in duplicate, by his process and that of Wanklyn, and the impression left on my mind by the limited experience I have had at present is, that, if the latter process be carried out exactly in accordance with the directions of its author, the agreement in the conclusions to be drawn from the results of the two methods will be much closer than it was found to be by Tidy, when working with his considerably modified form of the ammonia process.

Yours, &c.,

Shrewsbury, April 10th, 1879.

THOS. P. BLUNT, M.A., Oxon., F.C.S.

TO THE EDITOR OF "THE ANALYST."

SIR,—We observe in THE ANALYST for this month, there is a report of a paper read by Dr. Dupré, before the Society of Public Analysts, upon violet powder, in which the "Steamer Over a Globe" Violet Powder is prominently mentioned.

Passing over the fallacies and the erroneous conclusions\* contained in the paper, and the questionable proceeding of actually enumerating arsenic, amongst the constituents of different varieties of violet powder, in estimating their respective merits; to prevent any misunderstanding, we wish to state distinctly as a fact, that the solitary conviction at Lambeth, for selling violet powder, which appears to be Dr. Dupré's only crumb of comfort on this question, did not refer to our "Steamer Over a Globe" Violet Powder, or it would have been immediately appealed against; but, that when that invincible article was brought before the same magistrate, on April 2nd last, after hearing evidence on both sides, Mr. Chance pronounced this Violet Powder uninjurious, that there was no official formula for violet powder, hence it could not be said to be adulterated; he dismissed the summons, and also another against a different maker, thus virtually cancelling his former adverse decision, and leaving the article practically victorious in every case.

We enclose our card, and remain yours, &c.,

THE MANUFACTURERS OF THE "STEAMER OVER A GLOBE" VIOLET POWDER.

\* The writers omit to point out what are the fallacies and erroneous conclusions to which they allude.

—ED. ANALYST.]

ANALYSTS' REPORTS.

Mr. J. Baynes, Public Analyst for the East Riding of Yorkshire, reports that during the March quarter he examined forty-three samples, of which fourteen were adulterated, viz.: 1 of bread containing 28 grains of alum per 4lb. loaf, but as to which no conviction was obtained owing to the Somerset House Authorities; 1 of butter containing 20 per cent. of foreign fat; 4 of coffee containing from 16 to 40 per cent. of chicory; 5 of mustard containing from 5 to 60 of farina; and 3 of sweet spirits of nitre adulterated with from 26 to 50 per cent. of water.

Mr. Baynes also reports that, as Analyst for Scarborough, he examined nine samples during the past quarter, viz.: 1 of water; 2 of bread; 1 of gin adulterated with 24.8 per cent. of water; 1 of whisky adulterated with 38 per cent. of water; and 4 of milk, all of which were pure.

Mr. Baynes also reports that, as Analyst for Kingston-upon-Hull, he examined three samples of water, and five samples of milk, which latter were not submitted under the Act, but owing to the cattle disease being prevalent. All the samples were uncontaminated.

Mr. J. Carter Bell, Public Analyst for Salford, reports that during the past quarter he examined 135 samples, and he found twenty-three adulterated, consisting of 9 samples of milk, 4 of bread, 2 of coffee, and 8 of sweet spirits of nitre. He congratulated the health committee upon the marked improvement in the articles sold in the borough. "Some time since," the report continues, "it was common to find

bread containing 20, 30, and 40 grains of alum to the 4lb. loaf, a quantity, I believe, sufficient in many cases to be seriously detrimental to health; whilst now the adulterations are few and far between. Out of the many samples of bread and flour taken, only 4 were adulterated, and that in but a small proportion. Out of 220 samples of milk taken since March, 1878, I found 164 pure, 28 nearly so, and in only 28 cases was there such a departure from the standard as to justify a prosecution." In a special report of analyses which he had conducted to ascertain the adulteration of flour and bread with alum, Mr. Bell states that owing to the energetic manner in which the health committee had carried out the Adulteration Act, and particularly through having caused these investigations to be made, the adulteration of bread and milk in Salford has sunk almost to a minimum.

Mr. J. Carter Bell, Analyst for Cheshire, in his report for the quarter ended 31st March, states that he had examined 176 samples. Of these, 66 were adulterated, namely, 20 of gin, 13 of whisky, 7 of milk, 15 of coffee, 9 of sweet spirits of nitre, and 2 of annatto. Many samples of beer had been analysed during the past six months, and he had examined many of them for *cocculus indicus*, grains of paradise, tobacco, sulphate of iron, alum, and other noxious ingredients. In some cases such a lengthy examination could not be made, because the quantity of beer sent was too small to permit of a searching investigation.

Dr. Emmerson, Public Analyst for Leicestershire, reports that during the past quarter forty-two samples were submitted to him under the Act, viz: 14 of arrowroot, varying very much in quality, but all genuine; 14 of coffee, three of which were mixed with chicory; 14 of tea (10 green and 4 mixed)—with the exception of some samples, which were faced to improve the appearance of the teas, they were all genuine and pure. All teas being now examined by the Customs' authorities, and as tampering with the teas does not take place in this country, it is very rare now to meet with adulteration. The various samples of food, &c., which he had analysed had steadily improved in purity, and he had no doubt that the periodical visits of the inspectors, and the proceedings instituted under the Act, had proved a protection to the public against adulteration.

Mr. A. H. Allen, Public Analyst for Sheffield, in his quarterly report states that he has examined four specimens of compound tincture of camphor, an official preparation which is largely used by both the medical profession and the public, and which is closely related to the popular remedy known as "paregoric." Three of the samples turned out to be perfectly satisfactory preparations, and with respect to the fourth he found it deficient in alcohol, oil of anise, and benzoic acid, but it contained a proper proportion of opium, and he could express no decided opinion as to the proportion of camphor. The absence or omission of the oil of anise and benzoic acid was in a great measure a consequence of the preparation being made with alcohol deficient in strength. The value of them, in the proportion used, is too slight to be an important consideration. Although the benzoic acid and anise oil have a certain medicinal value and are not added to the tincture without a definite object, the chief remedial agent is the opium, which in the sample in question was present in proper amount. During the past quarter he had also had his attention called to a particular "teething and fever powder," which is stated to have produced very violent effects on more than one child to whom it was administered. On examination a sample proved to contain mercury and antimony in medicinal doses. Although the incautious administration of such a remedy might prove dangerous, it appeared that there was no power of dealing with the matter under the Sale of Food and Drugs Act, as the powders were intended to produce certain medicinal effects, and the inspectors got what they asked for, namely teething powders.

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ANALYSTS IN DORSETSHIRE.—Mr. Comyns Leach, Public Analyst for Dorset, has just been appointed to the same office for the borough of Weymouth at a salary of £10 per annum, and fees. Mr. George, of Dorchester, was originally an applicant for the office, but withdrew his application. Mr. Jones, Mr. Brierly, Mr. H. L. Hobbs, Mr. A. R. Wilson, Mr. C. E. Cassell, and Mr. A. Angel also applied—all, with the exception of Mr. Brierly, offering their services at ten guineas per annum, a fee of 10s. 6d. for food analyses, and a fee of a guinea for water analyses. Mr. Brierley asked £40 per annum. Dorchester borough has not yet made its appointment, and in several other boroughs in Dorset the matter is yet in abeyance.

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AN INNOCENT MAN FOUND GUILTY.—*The Grocer* reports that Mr. Frederick George Innocent was found guilty, and fined 10s. for selling adulterated coffee. We suppose it must be correct since the trade journal announces it.

## LAW REPORTS.

**TINCTURE OF CAMPHOR.**—Robert Bennett, chemist, King-street, Sheffield, was summoned under the 7th Section of the Sale of Food of Drugs Act, 1875, for selling a compound article or drug not composed of the ingredients in accordance with the demands of the purchaser. The Town Clerk (Mr. J. Yeomans) appeared to prosecute. Inspector Brammer, in February last, purchased from the defendant eight ounces of compound tincture of camphor, for which he paid 1s. 5d. He afterwards submitted a portion of it to Mr. A. H. Allen, the Borough Analyst. Mr. Allen's report was to the effect that his analysis showed that the compound contained 34 per cent. of alcohol, instead of 48 per cent. It also contained a mere trace of benzoic acid, and only a trace of oil of aniseed. Dr. Hime, Medical Officer of Health, said that the absence of the proper proportion of ingredients would prevent the article from having the effect it should have. Mr. Bennett said he was prepared to swear that the whole of the ingredients as required by the Pharmacopœia were in the compound in their proper proportions, with the exception of the spirit. The farriers required a weaker sort of spirit, and by mistake that spirit had been got hold of. He had been in business all his life, and this was the first time he had infringed the Act. A fine of £5 and costs was imposed.

**ADULTERATED COFFEE.**—At the Derby Borough Police-court, lately, Mr. Frederick George Innocent was summoned on the complaint of Mr. Clarke, inspector under the Act, for selling to him a quarter of a pound of what purported to be coffee, but which was not of the nature and substance of coffee. Mr. Clarke went to the defendant's grocery and provision shop in Depôt Street, and purchased a quarter of a pound of coffee for 4d. He then told the defendant that he was the inspector under the Food and Drugs Act for this borough, and had bought the coffee for examination by the Public Analyst. Defendant said—"All right; I know my coffee is all right. I buy it all right." Witness divided the coffee into three parts, which he sealed, and handed one part to the defendant, kept one himself (which he now produced), and handed the third to Dr. Goode, the Public Analyst. On March 28th he received a certificate from Dr. Goode, which stated that the coffee was mixed with 50 per cent. of chicory. Defendant said he was not at home often, and the shop was left almost entirely to his wife. The Chairman: But you are responsible, and you served the officer with the coffee—at least, with coffee and chicory, when he asked for coffee. The bench fined the defendant 10s. and costs, including the Analyst's fee of £1 1s. They also expressed their satisfaction that these cases of adulteration were being taken up, as poor people were those who suffered most by them.

**ADULTERATED CHOCOLATE.**—At the Teignmouth Police-court, J. W. Sowton, grocer, of Newton Abbot and Shaldon, appeared in answer to an adjourned summons, in which he was charged by Supt. Moore with having sold an article of food represented to be chocolate, but which was not of the nature and substance of chocolate, being adulterated with a mixture of coffee, arrowroot, and sugar. Supt. Moore stated that he went to the defendant's shop at Shaldon, and asked the assistant if he had any cocoa except that in packages. The assistant said he had not, and witness then asked if he had any chocolate. The assistant replied that he had, and witness asked to see it. The assistant then took some out of a tin canister on the counter, labelled "Chocolate," and showed it to him. Witness asked if it was pure chocolate, and the assistant said it was, and that they sold a good deal of it. Witness then asked for six ounces, which the assistant weighed up. It was first put up in one parcel; but afterwards, at witness's request, it was made up into three parcels of two ounces each, one of which he handed back to the assistant, and another he kept, whilst the third, fastened and sealed, he sent to Dr. Blyth, Barnstaple, the County Analyst. A few days afterwards he received Dr. Blyth's certificate of the analysis, as follows:—"I am of opinion that the sample is a sample of adulterated cocoa. The sample is not chocolate at all, and should not be sold as such. It is a mixture of cocoa, arrowroot and sugar. The per-centage of cocoa does not exceed 45·0 per cent." Supt. Moore said he paid 2½d. for the packets, and he proceeded to state that since the last hearing he had again written to Dr. Blyth, on the subject of chocolate, and he (Dr. Blyth) had replied as follows:—"I am not aware of the existence of any substance in commerce sold under the name of 'chocolate powder.' Chocolate itself is a paste, which is manufactured by grinding cocoa nibs in a mill, the rollers of which are heated by steam to soften the cocoa butter. The paste is afterwards mixed with refined sugar and a few flavouring matters, such as vanilla, almonds, cinnamon, cloves, &c. No arrowroot is used. On the other hand, cocoa is either sold in the form of nibs, which is simply the roasted seed deprived of its covering, or as flake cocoa, which is the seeds ground in a particular way. Lastly, the various mixed cocoas of commerce are incorporated with sugar, arrowroot, &c., and sold under various names, such as Soluble Cocoa, Homœopathic Cocoa, Epps's Cocoa, &c. Such are now almost invariably sold in packets, stating on a

label that the article is a mixture. If a person asks for chocolate, he expects to get the paste as above described, with certainly no admixture of arrowroot; if he asks for cocoa, then cocoa pure and simple must be given, unless it is definitely stated by label or otherwise that the article is mixed." Defendant here produced a large tin canister, labelled "Taylor Brothers' Chocolate Powder," and Supt. Moore admitted that he was supplied from the tin, or one of that kind. He added that he was not aware there was any difference between chocolate and chocolate powder. He asked for chocolate and he believed he had got what he asked for. In cross-examination Supt. Moore said he did not know there was such an article as Chocolate Menier, but he had heard of chocolate creams. He was positive that when the assistant took out some of the contents of the tin he did not say it was chocolate powder. The chairman asked the witness if he expected to get the article he asked for in powder or in substance. Supt. Moore replied that he did not know in which form he should receive it. Defendant thereupon took the objection that the article had not been sold "to the prejudice" of Supt. Moore, because he did not know what he wanted to buy. Supt. Moore admitted that he did not know there was such a thing as chocolate powder. Defendant said there was no such thing as pure chocolate; it was a manufactured article. Some was sold at 6½d. per lb. to meet the wants of the poorer classes, whilst Chocolate Menier and chocolate cake, being of a superior quality, were sold at 1s. 8d. per lb. John Peake, manager of defendant's branch shop at Shaldon, said when Supt. Moore asked him for chocolate he replied that he had chocolate powder. He then showed Supt. Moore part of the contents of the tin produced, told him it contained chocolate powder, and called his attention to the label on the tin to that effect. Defendant said as a matter of fact in the grocery trade there were many sorts of chocolate. It did not grow, like coffee, but was an admixture: there was no standard for chocolate, and never had been. In Nuttall's dictionary chocolate was defined as "an alimentary paste or cake, composed of the kernels of cocoanuts, roasted, ground, and mixed with other ingredients;" and in Royle's "Manual of Materia Medica" it was stated, "Chocolate is an artificial compound, prepared with cocoa, sugar, starch, vanilla, cinnamon, &c." Since the last hearing he had written to two of the principal houses in the country on the subject. Messrs. Cadbury Brothers, cocoa and chocolate manufacturers, of Birmingham, wrote, "The word chocolate implies a mixture of cocoa with other ingredients, and is understood as such when it passes the Customs, whereas the genuine article always passes through the Customs as 'cocoa.' We, therefore, never call anything cocoa unless it is a perfectly genuine article." Messrs. Taylor Brothers, cocoa and chocolate manufacturers, of London, wrote, "In selling chocolate it is not necessary to declare or affix a label; the word 'chocolate' itself, meaning an admixture, is sufficient." Being an admixture of a manufactured article, there could, defendant maintained, be no adulteration; and the price of the article asked for was a guide as to the quality required. The chairman said it was a very difficult point for the bench to decide upon. It was stated that chocolate was asked for, and that the article supplied was sold as chocolate, whereas the County Analyst said it was simply not chocolate at all. Defendant remarked that Dr. Blyth had made a standard for himself. The chairman went on to say that, as there was no such thing as chocolate, it was immaterial whether the superintendent was supplied with chocolate or chocolate powder; and as there was such difficulty in laying down what chocolate actually was, the bench had no other course to pursue than to dismiss the summons. It was not proved to them—in fact it was proved to the contrary—that there was any such thing as real chocolate, although it was included in the list of articles of food for Supt. Moore to examine to find if they were adulterated. Defendant said if the bench had decided the case against him he should have carried it to a higher court, as the matter was an important one to the grocery trade. The chairman admitted that it raised a very important point, and said he did not think they could have settled it in any other way than they had.

**ALUM IN BREAD.**—Thomas Smith, baker and flour dealer, Pendleton, appeared at the Police-court, in answer to a summons which charged him with having sold adulterated bread. Mr. Walker, assistant to the Town Clerk, prosecuted, and Mr. Bennet defended. Mr. C. Thompstone, the inspector under the Act, stated that he visited the defendant's shop on the 25th March and bought samples of bread and flour. While making the purchase the defendant came in and began to speak about dealing with a respectable firm for flour, and remarked to witness that "if anything there would be something in the Austrian flour." Mr. J. C. Bell, the Borough Analyst, said he had made analyses of the bread and flour submitted to him by the last witness. He found the bread to contain alum to the amount of 16 grains to the four-pound loaf. The flour he found to be perfectly pure. In answer to Mr. Bennet, the witness said he was not aware that it was easier to knead the dough when alum was mixed with the flour. When the flour had become bad alum made it work up easier. Mr. Bennet, on behalf of his client, pleaded that though it was true the bread was baked on the defendant's premises, Mr. Smith never entered the bakelhouse, and did not see the workmen. He could not, therefore, have committed

the offence for his own benefit. It was certainly easier to work up flour, and there was no doubt the men in the bakehouse had put alum in the flour to save them trouble. He thought the magistrates would come to the conclusion that though the defendant was liable to a fine the defendant's was not a bad case. Mr. Bennet called two of the defendant's employes to prove that the defendant was not in the habit of visiting his bakehouse. Mr. Makinson said in his opinion that was a bad case. A good deal of alum had evidently been put in the flour. The defendant would pay a fine of £10 and costs. It was stated to the magistrate shortly afterwards that the defendant refused to pay the fine. The defendant came before the court and gave as a reason for not paying the fine that he wanted to ask the Analyst a question and had not been allowed. Mr. Makinson informed the defendant that when he had counsel to defend him he (the defendant) could not address the Court and ask questions as well. The defendant said he had only seen Mr. Bennet that morning. Mr. Makinson said he should have done so earlier; that was his own fault. He made an order for distraint upon the defendant's goods in payment of the fine should he still refuse, and in default of having goods to distraint upon the defendant would have fourteen days' imprisonment. The defendant said he would pay the fine.

#### NOTES OF THE MONTH.

A very interesting case to Analysts has taken place since our last. A brewer in Donnington has been charged with adding sugar to his malt wort without possessing a licence to do so. It is always unsatisfactory to discuss a case of disputed analysis on the ordinary printed reports which are seldom perfectly accurate, but the following is an abstract of the proceedings as detailed in the newspaper before us. It seems that the officers entered the premises on the 26th November last, and found a brewing commenced before the specified time. They accordingly took samples of the wort, and sent the same to Somerset House, where the analysis was commenced by a Mr. Burge, one of the assistants, early on the 27th. The grains having been gauged by the officer, were found to correspond with the quantity of malt entered as used, and no sugar was found upon the premises, so that the whole case hinged upon Mr. Burge's analysis. He found the density to be 1092, and 12.72 per cent. of "sugar natural to malt" with 8.48 of cane sugar. The report does not state the process employed, but it appears, from subsequent indications, to have been the usual determination of glucose by "Fehling," and then another determination, after inversion, calculating the excess of copper used to cane sugar. The evidence of Mr. Burge was supported by Messrs. Bannister and Harkness, who had no doubt (from examining his results) as to the presence of cane sugar in the sample, and they further stated that, owing to the rapid conversion of cane sugar into glucose, and glucose into alcohol, such an analysis would be perfectly useless unless commenced within two or three days. They also asserted that, in fact, this very sample in dispute had lost all its sugar on the 5th December, and this is no doubt an important factor in the case. On the other side Mr. Hehner was called, who received the duplicate from the brewer on March 3rd, 1879. It then had a specific gravity of 1088, which he stated, "was a difference as against 1092 not worth speaking of, and my sample was as fresh as if just taken." He did not find a particle of cane sugar in it, although the analysis of the chemists for the prosecution was practically his own. "The majority of modern chemists think that there is no glucose in malt, but maltose, the latter making half as much again as what was called glucose. The malt wort calculated in this way would show no cane sugar." In a subsequent letter to a contemporary, Mr. Hehner further explains his views, which, omitting some rather strong language (always undesirable in a scientific discussion) are as follows:

"Upon the composition of genuine malt the case depended. Now a number of years ago it was pointed out by Continental chemists, and more recently was conclusively proved by English investigators, that malt and malt wort does not, as was formerly believed, contain a modification of sugar called glucose, but an altogether different substance, maltose. Numbers of modern chemists have placed this fact beyond dispute. It should have been the plain duty of the Excise chemists, either to alter their exploded notions as to the composition of malt, or they should have at once and publicly disproved their opponents' statements. A middle way seems to me to be impossible.

"But, marvellous to state, in the case against Mr. Kidd they actually ignore altogether the modern researches as to the substance called maltose, upon which the whole case turned; they did not deny its existence; they did not disprove it; they merely shut their eyes and ears, and declared virtually that they did not want to know anything about it.

"If there had really been cane sugar in the malt wort it would have been a comparatively easy matter to get it out of it again in the crystallised state, fit to be produced as incontrovertible evidence in town. They contend that it is impossible to get the cane sugar out of the liquor; but the thing has been done, and I myself am ready to do it."

We have thus shortly placed before our readers the germs of "a very pretty quarrel as it stands," and would, before making remarks ourselves, call attention to the importance of the subject, and ask for any communication our friends may be pleased to send *pro* or *con*, so that so important a matter may be thoroughly ventilated. No doubt the Excise chemists have many practical results on the point, for which we should be glad to find space, if they think fit to send them; and Mr. Hehner will also doubtless be able to give some experiments in support of his views.

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While looking over the *Brewers' Guardian*, which, of course, has something to say on the above case, we were struck with the idea, that it is very amusing to notice how the trade journals, who delight in applauding Somerset House when it goes against an analyst, can, at the same time, write against those they flatter, when they in turn decide against a trader. Verily popularity with all is difficult of attainment! Perhaps it is undesirable.

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*Apropos* of the mention of the proposed Adulteration Act for America at the last meeting of the Society, we may state that on February 27th last, a bill to prohibit the dilution of milk was introduced into the United States Legislature. The Act not only proposes to punish dilution, but pronounces "all milk obtained from animals fed on any substance in a state of putrefaction or fermentation to be impure and unwholesome milk within the meaning of the Act." The difficulty will be to obtain evidence of such feeding, otherwise the idea is a very good sanitary precaution.

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We have before had occasion to point out the lamentable manner in which the journal of a great corporation like the Pharmaceutical Society is occasionally made the vehicle of venting personal spleen, and ignoring the claims of those privately distasteful to certain parties. This occurred noticeably in connection with the organization scheme, and now again it crops up in a most unpatriotic, unjust manner, on the question of butter analysis. When Messrs. Angell and Hehner published their book on butter it was met by the editor of the *Pharmaceutical Journal* with a most cutting review, in which misprints were taken advantage of to detract from its value, and the uselessness of the process and absurdity of the conclusions broadly hinted at. Since then the successive researches of Dupré, Muter, Jones and others, which have culminated in perfecting and reducing to exactness the butter process as now universally employed in England, have been invariably passed over in complete silence by this journal, which

professes to keep *au courant* with chemical science. But the moment a foreign chemist happens to plagiarize the process, and write a paper, giving in his own name what is practically the English method of butter analysis, as perfected by the members of our Society and published in *THE ANALYST*, forthwith the *Pharmaceutical Journal* wakes up to the fact, and the full English process of butter analysis appears—not in the names of its originators and improvers, but in that of a Mr. H. Hager, whose name was never heard of before in connection with butter analysis. Perish the thought of recognising home researches; never mind what occurs at our very doors, so long as we can bring in a foreigner to take the credit in the minds of the members of the Pharmaceutical Society. Surely the readers of the *Pharmaceutical Journal* must have known all that is in Mr. Hager's paper long ago, or else they are sadly behind the times.

Mr. A. Angell has been appointed Public Analyst for Newport, Isle of Wight; also for the Borough of Guildford.

Mr. E. H. Moore has been appointed Public Analyst for Chichester.

Mr. T. H. Walker has been appointed Public Analyst for Carlisle.

Mr. J. Baynes has been appointed Public Analyst for Grimsby.

#### ON THE WORK DONE BY PUBLIC ANALYSTS UNDER THE SALE OF FOOD AND DRUGS ACT DURING 1878.

A PRINTER'S error occurs in the second paragraph of the paper on this subject, published on page 67 of our last number. The percentage of adulteration during the last few years should be as follows:—

During the time of the Lancet Commission .. .. .	65·0
„ 1872 .. .. .	26·0
„ 1875—6 .. .. .	18·1
„ 1877 .. .. .	17·7
„ 1878 .. .. .	16·58

#### THE SANITARY FLUID.

**THIS** is the disinfectant which was adopted by the authorities at Woolwich for use during the recovery of the bodies from the wreck of the *Princess Alice*, and the mere fact that its use under such trying conditions proved satisfactory says something in its favour. In chemical composition it is essentially a solution of an alkaline hypochlorite, with slight excess of alkali. Hence the liberation of chlorine is slow and fairly constant for some time. Two experiments on samples of urine gave satisfactory results, as putrefaction was retarded for several days longer than in similar samples treated with carbolic acid solution.

#### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price.
3163	J. Schwartz .. .. .	Manufacture of Sugar .. .. .	2d.
3252	A. P. Price .. .. .	Treatment of Saccharine Substances .. .. .	6d.
3282	A. A. Croll .. .. .	Manufacture of Sulphate of Alumina .. .. .	4d.
3315	C. W. Siemens .. .. .	Apparatus for Electric Lighting .. .. .	2d.
3341	J. P. Rickman .. .. .	Manufacture of Ammonia .. .. .	6d.
3386	R. W. Papineau .. .. .	Employing Bisulphide of Carbon, for recovering various substances .. .. .	6d.
3489	J. Wraith and G. A. Downs .. .. .	Preparing and Dyeing Fabrics .. .. .	6d.
3518	A. R. Molison .. .. .	Electrical Apparatus for Igniting Gas .. .. .	6d.
3701	J. Mactear .. .. .	Apparatus for obtaining Sulphurous Acid .. .. .	6d.
3783	H. Gaskell .. .. .	Manufacture of Alkali .. .. .	2d.
5016	H. J. Haddan .. .. .	Treating Ores containing Silver and Copper .. .. .	4d.

#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Boston Journal of Chemistry; The Dairyman; The American Dairyman; The Practitioner; American New Remedies; Proceedings of the American Chemical Society; *Les Fraticien*; The Inventors' Record; Electric Lighting, by R. P. Spice.



# THE ANALYST.

JUNE, 1879.

## SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING of this Society was held on the 30th April, 1879, at Burlington House, Piccadilly, the President, Dr. Muter, M.A., F.C.S., in the chair.

The minutes of the previous meeting were read and confirmed.

Mr. Hehner was appointed Scrutineer to open the voting papers, and reported that Mr. J. Nimmo, Assistant to Mr. Bernard Dyer, of London, and Mr. J. W. Tayler, Assistant to Dr. Baker Edwards, of Montreal, Canada, had been elected as Associates.

Mr. Heisch read a paper by Mr. Allen "On the Analytical Examination of Tinctures."

Mr. Heisch also read a paper by Mr. Wigner "On Milk Preservatives."

And a paper by Mr. F. P. Perkins "On a Microscopical Study from the Bottom of a Claret Cask."

The next Meeting of the Society will be held at Burlington House, on Wednesday, June 4th, at half-past seven o'clock, when the following amongst other papers will be read: "On the Analysis of Spiritus Ætheris Nitrosi," by Dr. Dupré, F.R.S.; "On the Analysis of Flour and Bread," by J. Carter Bell, F.C.S.; "On the Composition of Devonshire Cream," by A. Wynter Blyth, M.R.C.S.

## NOTES ON THE ANALYTICAL EXAMINATION OF TINCTURES.

BY ALFRED H. ALLEN, F.C.S.

*Read before the Society of Public Analysts, on 30th April, 1879.*

I HAVE had occasion lately to make some experiments on the "Tinctures" of the British Pharmacopœia, and as some of my experiences are of a rather novel character they appear worth recording.

I may premise that the so-called "tinctures" or "spirits" of pharmacy, are of two distinct alcoholic strengths. "Rectified Spirit, B.P." (sp. gr.  $\cdot 838 = 84$  per cent. by weight of absolute alcohol =  $155\frac{1}{2}$  per cent. of proof spirit), is directed to be employed in the preparation of the tinctures and spirits of chloroform, ether, aconite, ferric chloride, ferric acetate, iodine, myrrh, nux vomica, camphor, ginger, &c. On the other hand, "Proof Spirit, B.P." (sp. gr.  $\cdot 920 = 49$  per cent. by weight of absolute alcohol), is directed to be used in making the tinctures of orange-peel, belladonna, cantharides, catechu, digitalis, ergot, opium, rhubarb, squills, &c.

In many instances, the alcohol is the chief element of cost in the preparation of tinctures, and there is consequently a strong inducement to economise it as much as possible. Hence, it is not unusual to find proof spirit substituted for rectified spirit, and a mixture of equal measures of rectified spirit and water for proof spirit. Of course, alcohol so deficient in strength is apt not to dissolve the active constituents of the drugs employed.

On the other hand, some of the leading firms prepare their tinctures with alcohol of 60° O.P., and yet use it in the same proportion as if it were merely 55° O.P., as required by the Pharmacopœia.

In many of the official tinctures, the determination of the alcohol presents no difficulty. Mere distillation will suffice to separate it in a state of approximate purity from the tinctures of aconite, arnica, belladonna, calumba, capsicum, catechu, jalap, nux vomica, opium, quinia, &c.; and the same is true of the tinctures of iodine, ferric acetate, &c., if they be first rendered distinctly alkaline with caustic soda. On the other hand, the tinctures of benzoin, myrrh, ginger, camphor, rhubarb, &c., give a distillate contaminated with essential oils or similar volatile matters in quantity sufficient to affect, more or less seriously, the determination of alcohol by the density. The same is true of the "aromatic spirit of ammonia," and tinctures prepared with it, with the additional objection that the distillate will contain ammonia, unless the alkaline reaction of the spirit be previously carefully neutralized by hydrochloric acid.

If any of the tinctures to which the distillation process is not directly applicable be diluted considerably with water, the essential oil is precipitated more or less completely, but usually in so fine a state of division that filtration is completely useless. I find, however, that this difficulty may be got over very simply by operating in the following manner:—50 c.c. of the sample are taken and diluted with water to about 850 c.c. This causes the precipitation of the greater part of the essential oil or resinous matter. A few drops of a strong solution of calcium chloride are next added, and this is followed by some solution of sodium phosphate, the liquid being vigorously stirred. The flocculent precipitate of calcium phosphate effectually entangles the finely divided essential oil and clarifies the liquid. The liquid is next diluted to a definite volume, 400 c.c. being sufficient if the tincture were prepared with proof spirit, but 500 is preferable if rectified spirit should have been originally employed. The solution is then thoroughly agitated and passed through a dry filter. A known measure is then carefully distilled at a low temperature, and the distillate made up exactly to the volume occupied by the liquid before distillation. The density of the distilled spirit is then taken, and the corresponding percentage of proof spirit learnt by reference to a table. Evidently the proportion of proof spirit in the original tincture will be either 8 or 10 times the amount found in the distillate, according to the extent of dilution practised.

It is convenient to state the strength of the tincture in percentages of proof spirit, as any deficiency in strength is then at once apparent, and the extent of dilution is readily calculated.

With a view of testing the accuracy of this mode of assaying tinctures, I have made various experiments. The following data indicate the extent to which the process may be relied on.

A sample of tincture of myrrh was prepared according to the directions of the Pharmacopœia, and on examination gave the following results:—

	Sp. Gravity	Proof Spirit = Absolute Alcohol	
		by volume.	by weight.
Spirit used for preparing tincture.....	·8378	156·7	84·1
Tincture.....	·8549	146·0	77·3
Spirit in tincture calculated from results		150·7	80·8
of distillation		151·0	80·9

It would appear from these results, that about 6 per cent. less of proof spirit was obtained than was present in the alcohol used in preparing the tincture, and, therefore, that the method is in error to this extent. This conclusion is not justified, for in the above calculation it is assumed that no increase in the bulk of the spirit occurs on saturating it with myrrh; but the following data show that this assumption is not warranted:—5 grammes of myrrh previously dried at 100° C. were added to 40 c.c. of rectified spirit of .8280 specific gravity. After standing 48 hours, the tincture was filtered, the residue washed with a little spirit, dried, and weighed. Its weight was 3.142 grammes, so that 1.858 grammes had dissolved in the spirit. The density of the tincture was found to be .8432. The weight of alcohol used was  $.828 \times 40 = 33.120$  grammes, which, added to the weight of the dissolved myrrh, gives 34.978 as the weight of the tincture. This, divided by the observed density, gives 41.4 c.c., as the measure of the tincture. Hence 100 c.c. would have increased to 103.5 c.c. In another experiment the volume was found to be 103 c.c., and in a third experiment, on double quantities, it came to 104.6. The mean of these estimations is 103.7. Thus the percentage of alcohol found in tincture of myrrh ought to be multiplied by 1.037 to get the true strength of that employed in its preparation. Applying this correction to the alcohol found by distillation of the tincture of myrrh, we obtain 156.3 and 156.6 per cent. of proof spirit, against 156.7 employed in preparing the tincture, a result which leaves nothing to be desired.

A very striking example of expansion of the fluid occurs in the preparation of the "Spirit of Camphor, B.P." In one experiment I placed 10 grammes of camphor in a graduated cylinder, and added 90 c.c. of rectified spirit of .880 specific gravity. The tincture produced measured exactly 100 c.c., so that, as camphor has a density of .996, 10 grammes would measure 9.96 c.c., and hence camphor dissolves in alcohol without sensible change of volume. The tincture was found by experiment to have a density of .8446, the theoretical density, assuming no change of volume, being .8466. Therefore the action of alcohol on camphor appears not to be strictly that of a solvent. It seems to act rather by causing liquefaction of the camphor, subsequently mixing with the resultant liquid without notable change of volume. Its action may be compared to that of chloral hydrate on camphor.

In consequence of this peculiarity, the proportion by volume of proof spirit contained in spirit of camphor will be  $\frac{1}{10}$ ths of that present in the alcohol used in its preparation, and there is no doubt that a similar correction ought to be applied in certain other cases.

When the modified distillation process already described is applied to spirit of camphor, the determination of the alcohol can only be affected approximately. Even when the spirit is previously diluted with 9 times its volume of water, the distillate has a distinct smell and taste of camphor. This is doubtless a consequence of the solubility of camphor in water, for the distillate obtained from tincture of myrrh retains no trace of its origin.

It is very probable that Monell's colorimetric method\* might be advantageously utilized for the estimation of alcohol in spirit of camphor, but I have not been able to try the experiment.

\* *Journ. Chem. Soc., 1878, II., 246.*

I have not made any attempt to determine the camphor in a spirit or tincture containing it, but may suggest that its action on polarized light would probably afford a fairly accurate means of estimating it. The specific rotatory power of common or dextro-camphor, in alcoholic solution, is + 47.4 for the transition tint.

My attention has been recently called to the analysis of the official "Compound Tincture of Camphor," owing to the following circumstances. A medical practitioner in Sheffield had reason to suspect some compound tincture of camphor supplied him by a well-known local pharmacist, and so submitted it to a wholesale firm in London, whose chemist reported it to be deficient in alcohol and some other constituents. The medical man thereupon, through the agency of a brother practitioner, called the attention of the inspector to the matter and supplied him with a signed written order (in Latin) for 8 oz. of the tincture. In due course, the sample was procured and submitted to me, and I certified that it contained only about 34 per cent. of absolute alcohol (=71.4 per cent. of proof spirit), instead of being made with proof spirit, and was nearly destitute of benzoic acid and oil of anise. The proportion of opium was not found to be deficient, and I expressed no opinion on the proportion of camphor. In the sequel, the vendor was prosecuted and fined £5 and costs.

From a consideration of the facts, it seems probable that the proportion of alcohol was cut down from motives of economy. The deficiency of alcohol compels a considerable reduction in the proportion of the oil of anise, as the weaker spirit used will not dissolve the half-drachm to the pint prescribed by the Pharmacopœia.

In devising a method for examining such a complex preparation as the compound tincture of camphor, it appeared desirable to analyse a number of samples of known purity. In this I have been assisted by Mr. L. Siebold, of Manchester, to whom I am indebted for the analytical results obtained by the examination of three samples of the tincture, and for a check-analysis of the adulterated sample.

In the following description, A and B are specimens of the tincture purchased by Mr. Siebold in Manchester, and probably prepared with spirit at 60° O.P. C is a sample prepared by Mr. Siebold himself. C 1 S and C 1 A are the adulterated sample as examined by Mr. Siebold and myself respectively; and C 2, C 3, C 4, and C 5 are samples purchased from well-known Sheffield pharmacists; C 5 being prepared specially for me.

The following are the densities of the original samples, without distillation or any other manipulation:—

A	B	C	C 1 S	C 1 A	C 2	C 3	C 4	C 5
.9147	.9150	.9205	*9508	.9533	.9231	.9321	.9212	.9240

From these figures it is evident that the small proportions of solid constituents present in compound tincture of camphor do not very materially affect the density, and hence that the specific gravity affords a very good approximate indication of the strength of the alcohol with which it was prepared.

However, the modified distillation process already described admits of the determination of the alcohol with all desirable accuracy, provided that a slight excess of alkali be added prior to distillation to prevent volatilization of benzoic acid. By

\* The quantity of tincture at Mr. Siebold's disposal was very small, and the density was determined by noting the weight of 10 c.c.

proceeding in this manner, the alcohol is obtained unmixed with anything except the  $1\frac{1}{2}$  grains per ounce of camphor, an amount which I have proved experimentally has no appreciable influence on the density. The clarification of the liquid with chloride of calcium and phosphate of sodium is really superfluous in the case of the compound tincture of camphor, for the small proportion of the oil of anise does not affect the density of the distillate, though it renders it milky. A useful modification of the process is to employ chloride of calcium, but to precipitate it with carbonate of sodium instead of the phosphate, and thus clarify the diluted tincture and render it alkaline at the same time.

The experiments made on the samples of compound tincture of camphor already mentioned have shown that the true percentage of proof spirit, as determined by distillation, is never more than two degrees in excess of that deduced from the density of the original tincture.

The alkaline liquid which remains in the retort after distilling off the spirit is of service for the determination of the benzoic acid. If concentrated to one-half of the volume of the original tincture employed, it should give an immediate and copious precipitate of benzoic acid on being strongly acidified by concentrated hydrochloric acid. If the acid liquid be then shaken with ether, and the upper layer of liquid removed with a pipette, the benzoic acid is readily obtained in a state of approximate purity. If the ethereal layer be transferred to a small beaker, and the ether evaporated spontaneously by a current of dry air from an aspirator or bellows, the benzoic acid remains as a crystalline residue, which may be further examined. If the shaking with ether be repeated the extraction of the benzoic acid is perfect, a very fair approximate determination of its quantity may be obtained, even on as small a quantity as 5 c.c. of the tincture. Chloroform may be substituted for the ether with some little advantage. In the adulterated sample, neither Mr. Siebold nor I could detect any trace of benzoic acid; the ethereal extract was but faintly acid, a re-action which proved to be due to the presence of a trace of meconic acid.

A very fair idea of the proportion of opium present in compound tincture of camphor may be obtained by diluting the sample with proof spirit and adding ferric chloride. By comparing the depth of red colour produced with that given by a standard tincture, in a manner similar to Eggertz' colorimetric method of determining carbon in steel, a good approximation to the proportion of opium can be obtained. Of course the percentage of meconic acid contained in different samples of opium is somewhat variable, and hence the determination is but approximate. A useful check is obtained by drying up a known measure of the tincture until the residue ceases to lose weight; but such a process is quite invalid if the tincture has been artificially coloured by caramel or similar material, a practice which is extremely common.

I have recently examined several samples of "Paregoric Elixir" which were found to be wholly destitute of opium. As the name "Paregoric Elixir" was formerly official, and has never been applied to any other preparation than that now represented by the compound tincture of camphor, this omission appears to be a distinct infringement of the Sale of Food and Drugs Act.\*

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\* Since this paper was read, two convictions have taken place at Dewsbury for selling "Paregoric Elixir" which was destitute of opium.

The proportion of oil of anise present in a sample of compound tincture of camphor may be judged of by the readiness with which the liquid is precipitated on dilution with water. With a proper proportion of oil, hardly any dilution can be effected without a milky precipitate being formed. In the case of the adulterated sample already described no precipitation occurred, no matter how much water was added. It was also proved by experiment that the proportion of oil of anise which could be dissolved in spirit of 80° O.P. was but a mere fraction of that taken up by proof spirit. Mr. Siebold found that samples A, B and C were precipitated by water even when mixed with seven volumes of proof spirit, and from this fact he estimated the proportion of oil of anise in C 1 S at less than one-eighth of the normal amount.

In addition to assistance afforded me by Mr. Siebold, I have to acknowledge my indebtedness to Mr. W. F. Cocker, who has made most of the test experiments in trial of the processes described in this paper.

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## NEW METHOD FOR THE EXAMINATION OF BUTTER FOR FOREIGN FATS.

BY DR. J. KOETTSTORFER.

[We are indebted to Dr. Dupré, F.R.S., for the following important Translation from the *Zeitschrift für Analytische Chemie*, von Dr. C. R. Fresenius, 1879, p. 199.]

THE analysis of butter, according to Angell and Hehner's method, teaches us that this substance contains a far greater proportion of fatty acids with from ten atoms downwards of carbon than had previously been assumed. Since most other fats contain only the higher fatty acids, and the lower acids of the series have a smaller molecular weight than these, butter must contain more molecules of acid than an equal weight of another fat, and from the above it would appear that the difference in the number of molecules may be not inconsiderable.

Therefore it seems feasible to estimate volumetrically the number of equivalents of acids contained in butter and other fats, from the amount of K H O necessary for complete saponification, and to distinguish butter from other fats by calculating the differences in potash used.

In reality, this difference, as the experiments recorded below show, is such that it may be used for the detection of adulterated butter as readily as the difference between the insoluble fatty acids found in butter and in other fats. This new method for testing butter has the advantage over Angell and Hehner's that it is much simpler and far more rapid of execution, since an analysis may be finished in half-an-hour, provided all necessary standard solutions are ready.

The use of volumetric analysis in the examination of butter is not new. W. Heintz and Dupré\* have already proposed, as modifications of Angell and Hehner's method, estimating the soluble acids by titration. By my method, however, which is based on a different principle, the whole of the acids contained in a fat are estimated by titration.

The carrying out of the new method requires a standard hydrochloric acid and a standard alcoholic potash solution. I am in the habit of using half normal hydrochloric acid and a solution of K H O in highly rectified spirit of about the same strength. As

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\* Dupré's method was published nearly two years before Heintz's.—EDITORS ANALYST.

indicator I use a dilute alcoholic solution of phenol-phtalein, as recommended by Dr. E. Luck, and always add the same quantity in each experiment.

The examination of the fats is made as follows :—From 1 to 2 grammes of the fat, purified by melting and filtration, are weighed in a high beaker of about 70 c.c. capacity, 25 c.c. standard alcoholic potash are added, and the whole heated in a water-bath. When the alcohol is nearly boiling the mixture is stirred with a glass rod till all the fat is dissolved, which does not take more than a minute. The glass rod is washed with a little alcohol and put into a safe place; the beaker is covered with a watch-glass and heated further for 15 minutes, in such a manner that the alcohol does not boil too violently. At the end of the quarter of an hour the watch-glass is washed with spirit and the alcoholic solution is stirred for one minute longer with the glass rod before used, so as to saponify any fat that might still adhere to it. The solution is now taken from the water-bath, 1 c.c. of alcoholic solution of phenol-phtalein is added, and it is titrated back with half normal hydrochloric acid. The point of neutrality is very sharply indicated, the liquid becoming pure yellow when changing to the acid re-action.

From the difference between the amounts of hydrochloric acid required by 25 c.c. standard alkali and the amount used in the above titration, the amount of  $\text{K H O}$  combined with the acids of the fat is calculated.

As regards the time of heating, I have convinced myself, by repeated experiments, that five minutes, as recommended by Angell and Hehner, is not always sufficient—more particularly in the case of butter, but that a quarter of an hour is always enough to saponify fats completely and give uniform results.

Since the titre of an alcoholic potash solution is always lowered slightly when it is heated with access of air in consequence of oxidation of the alcohol, it is advisable to standardise it by heating 25 c.c. for 15 minutes in a water-bath, as in the saponification of the fat, before testing with the standard acid. The difference between the heated and unheated potash solution amounts to from  $\frac{1}{16}$ th to  $\frac{1}{2}$  c.c. normal hydrochloric acid. The titre of the potash solution diminishes by the same amount, in the course of five to six days, at ordinary temperature, owing to the oxidation of the alcohol, and it is therefore advisable to control the potash solution from time to time.

Standard sulphuric acid cannot well be substituted for the hydrochloric acid, since this yields a precipitate of  $\text{K}_2\text{SO}_4$ , which masks the final re-action.

The saturation capacity of the acids contained in a fat might be expressed in per cents. of  $\text{K H O}$  necessary for saponification. Since, however, as shown by the experiments given below, the errors of analyses of several samples of the same fat do not alter the figures in the first decimal, it may be better to convert them into full numbers, and calculate the amount of  $\text{K H O}$  used by 1000 parts of fat. In the following experiments, I therefore give the number of milligrammes of  $\text{K H O}$  which saponify 1 gramme fat.

SAMPLES OF BUTTER FROM THE NEIGHBOURHOOD OF FIUME.

Substance 1.—1.224	grms. saponified	$\text{K H O}$	0.27868	grms. =	on 1	grm. fat	227.7	milligrams.	$\text{K H O}$ .
1.520	"	"	0.34584	"	=	"	227.5	"	"
1.4145	"	"	0.32119	"	=	"	227.1	"	"
1.236	"	"	0.28101	"	=	"	227.4	"	"
1.317	"	"	0.29827	"	=	"	226.9	"	"

Mean for 1 grm. fat 227.3 milligrams.  $\text{K H O}$ .

Substance 2.—1.171 grms. saponified K H O 0.26645 grms. = on 1 gm. fat 227.5 milligrms. K H O.  
 1.398 " " " 0.31712 " = " " 226.8 " "

Mean for 1 gm. fat 227.2 milligrms. K H O.

Substance 3.—1.436 grms. saponified K H O 0.32411 grms. = on 1 gm. fat 225.9 milligrms. K H O.  
 1.481 " " " 0.33401 " = " " 225.5 " "

Mean for 1 gm. fat 225.7 milligrms. K H O.

Substance 4.—1.403 grms. saponified K H O 0.32556 grms. = on 1 gm. fat 232.0 milligrms. K H O.  
 1.257 " " " 0.29266 " = " " 232.8 " "  
 1.237 " " " 0.28741 " = " " 232.4 " "

Mean for 1 gm. fat 232.4 milligrms. K H O.

Substance 5.—1.451 grms. saponified K H O 0.32847 grms. = on 1 gm. fat 226.4 milligrms. K H O.  
 1.562 " " " 0.35293 " = " " 226.0 " "  
 1.470 " " " 0.33080 " = " " 225.8 " "

Mean for 1 gm. fat 226.1 milligrms. K H O.

Substance 6.—1.644 grms. saponified K H O 0.36546 grms. = on 1 gm. fat 222.3 milligrms. K H O.  
 1.898 " " " 0.42137 " = " " 222.0 " "

Mean for 1 gm. fat 222.2 milligrms. K H O.

Substance 7.—1.885 grms. saponified K H O 0.42632 grms. = on 1 gm. fat 226.2 milligrms. K H O.  
 1.726 " " " 0.39137 " = " " 226.8 " "

Mean for 1 gm. fat 226.5 milligrms. K H O.

Substance 8.—1.870 grms. saponified K H O 0.41447 grms. = on 1 gm. fat 221.6 milligrms. K H O.  
 1.855 " " " 0.41176 " = " " 222.0 " "

Mean for 1 gm. fat 221.8 milligrms. K H O.

Substance 9.—1.731 grms. saponified K H O 0.39691 grms. = on 1 gm. fat 229.3 milligrms. K H O.  
 1.759 " " " 0.40448 " = " " 229.9 " "

Mean for 1 gm. fat 229.6 milligrms. K H O.

Substance 10.—1.554 grms. saponified K H O 0.36002 grms. = on 1 gm. fat 231.7 milligrms. K H O.  
 1.744 " " " 0.40273 " = " " 230.9 " "

Mean for 1 gm. fat 231.3 milligrms. K H O.

Clarified butter from a reliable source from Upper Austria, by feeding with green clover, September—

Substance 11.—1.966 grms. saponified K H O 0.43534 grms. = on 1 gm. fat 221.4 milligrms. K H O.  
 1.524 " " " 0.33764 " = " " 221.6 " "  
 0.662 " " " 0.14665 " = " " 221.5 " "

Mean for 1 gm. fat 221.5 milligrms. K H O.

Clarified butter from same source, same feeding, October—

Substance 12.—1.571 grms. saponified K H O 0.35235 grms. = on 1 gm. fat 224.3 milligrms. K H O.  
 1.716 " " " 0.38526 " = " " 224.5 " "

Mean for 1 gm. fat 224.4 milligrms. K H O.

Clarified butter from same source, feeding with hay, November—

Substance 13.—1.585 grms. saponified K H O 0.35352 grms. = on 1 gm. fat 223.0 milligrms. K H O.  
 1.744 " " " 0.38992 " = " " 223.6 " "

Mean for 1 gm. fat 223.3 milligrms. K H O.

If we take the clarified butter with the butters, the amount of K H O necessary for saponification varies in the thirteen estimations between 221.5 and 232.4 milligrammes for 1 gramme fat—a range of 10.9 milligrammes.

Dr. U. Fleischmann has found 85.79 per cent. and 89.73 per cent. as the limits for the acids insoluble in water. If we compare these variations of butters with those found according to my method, they will be found nearly to agree; since

$$221.5 : 232.4 = 85.79 : 90.01.$$



For comparison with butters, those fats used for the adulteration of melted butter, or for the manufacture of artificial butter, were examined. These generally contain stearin, olein and palmitin. By calculation

1	gramme	stearin	combines with	188.8	milligrammes	K H O.
1	"	olein	"	190.0	"	"
1	"	palmitin	"	208.0	"	"

It was, therefore, to be expected that such fats would require less K H O for saponification than butter. This is found to be the case in the following analyses:—

Beef dripping prepared in the laboratory:—

Substance 14.—	1.269	grms.	saponified	K H O	0.24985	grms.	= on	1	grm.	fat	196.9	milligrms.	K H O.
	1.449	"	"	"	0.28421	"	=	"	"	"	196.1	"	"
	1.507	"	"	"	0.29644	"	=	"	"	"	196.7	"	"
	1.909	"	"	"	0.37448	"	=	"	"	"	196.2	"	"

Mean for 1 grm. fat 196.5 milligrms. K H O.

Commercial tallow—

Substance 15.—	1.320	grms.	saponified	K H O	0.35788	grms.	= on	1	grm.	fat	196.6	milligrms.	K H O.
	1.414	"	"	"	0.27839	"	=	"	"	"	196.9	"	"
	1.631	"	"	"	0.32119	"	=	"	"	"	196.9	"	"

Mean for 1 grm. fat 196.8 milligrms. K H O.

Lard, from kidneys, prepared in the laboratory—

Substance 16.—	1.404	grms.	saponified	K H O	0.27480	grms.	= on	1	grm.	fat	195.7	milligrms.	K H O.
	1.344	"	"	"	0.26354	"	=	"	"	"	196.1	"	"
	1.658	"	"	"	0.32440	"	=	"	"	"	195.7	"	"

Mean for 1 grm. fat 195.8 milligrms. K H O.

Lard, from unsmoked bacon, prepared in the laboratory—

Substance 17.—	1.544	grms.	saponified	K H O	0.30256	grms.	= on	1	grm.	fat	196.0	milligrms.	K H O.
	1.791	"	"	"	0.35031	"	=	"	"	"	195.6	"	"
	1.751	"	"	"	0.34245	"	=	"	"	"	195.6	"	"

Mean for 1 grm. fat 195.7 milligrms. K H O.

Commercial lard, professedly American—

Substance 18.—	1.896	grms.	saponified	K H O	0.36982	grms.	= on	1	grm.	fat	195.1	milligrms.	K H O.
	1.991	"	"	"	0.38963	"	=	"	"	"	195.7	"	"

Mean for 1 grm. fat 195.4 milligrms. K H O.

Mutton dripping, prepared in the laboratory—

Substance 19.—	1.608	grms.	saponified	K H O	0.31653	grms.	= on	1	grm.	fat	196.9	milligrms.	K H O.
	1.706	"	"	"	0.33604	"	=	"	"	"	197.0	"	"

Mean for 1 grm. fat 197.0 milligrms. K H O.

Olive oil—

Substance 20.—	1.647	grms.	saponified	K H O	0.31653	grms.	= on	1	grm.	oil	192.2	milligrms.	K H O.
	1.703	"	"	"	0.32644	"	=	"	"	"	191.7	"	"
	1.309	"	"	"	0.25068	"	=	"	"	"	191.5	"	"

Mean for 1 grm. fat 191.8 milligrms. K H O.

Colza oil—

Substance 21.—	2.024	grms.	saponified	K H O	0.36080	grms.	= on	1	grm.	oil	178.3	milligrms.	K H O.
	1.593	"	"	"	0.28508	"	=	"	"	"	179.0	"	"

Mean for 1 grm. oil 178.7 milligrms. K H O.

The maximum amount of K H O necessary for saponification is, according to the preceding analyses, for 1 gramme fat 197 milligrammes, and the difference from butter is large enough to be used for the approximate calculation of the percentage of other fats with which any given sample of butter may be adulterated. For example, in this

place clarified butter is frequently mixed with lard. Two samples of clarified butter bought in Fiume yielded the following results—

Substance 22.—1.658 grms. saponified K H O 0.37565 grms. = on 1 gm. fat 226.6 milligrms. K H O.  
 1.622 " " " 0.36779 " = " " 226.8 " "

Mean for 1 gm. fat 226.7 milligrms. K H O.

Substance 23.—1.410 grms. saponified K H O 0.30197 grms. = on 1 gm. fat 214.1 milligrms. K H O.  
 1.390 " " " 0.29819 " = " " 214.5 " "  
 1.625 " " " 0.34711 " = " " 213.6 " "

Mean for 1 gm. fat 214.1 milligrms. K H O.

This shows that the first of the two samples is unadulterated, the second adulterated clarified butter: for according to the previously given analyses of various kinds of butter the minimum amount of K H O necessary to saponify 1 gramme butter equals 221.5 milligrammes.

Up to now I have, to my regret, been unable to procure any so-called oleo-margarin, from which, at present, most of the artificial butter is made. I have, however, received from Sarg some best Vienna Sparbutter (economical butter), made, according to the description which accompanied it, out of 50 kilos. oleo-margarin and 25 litres milk. Since the proportion of butter which this amount of milk could add to the mixture is scarcely 1 per cent., the result of the examination of the fat will differ but slightly from that obtained from oleo-margarin.

Oleo-margarin is obtained from beef tallow through separation of stearin. If we take into consideration the above given figures for stearin, olein and palmitin, one should expect that oleo-margarin, after the separation of stearin which combines with the smallest proportion of K H O, would require more K H O for saponification than tallow. The examination of the economical butter yielded, however, the opposite result.

Best Vienna economical butter, from Sarg—

Substance 24.—1.797 grms. saponified K H O 0.35206 grms. = on 1 gm. fat 195.9 milligrams. K H O.  
 1.752 " " " 0.34274 " = " " 195.6 " "

Mean for 1 gm. fat 195.8 milligrams. K H O.

The addition of about 1 per cent. butter increases the amount of K H O necessary, by 0.2 to 0.3 milligramme; 1 gramme oleo-margarin, from which the sample of economical butter was made, would therefore have required 195.5 milligrammes K H O for complete saponification.

Beef tallow requires, according to the analyses given under Nos. 14 and 15, 197.7 milligrammes K H O. It seems, therefore, that in the manufacture of oleo-margarin, somewhat more palmitin than stearin is separated: for, if stearin were chiefly removed, the oleo-margarin would require more K H O for saponification than tallow.

As lard, according to experiments 16, 17 and 18, requires nearly the same amount of K H O for saponification as oleo-margarin, and butter is mostly adulterated with these two substances, we may take the number 195.5 as the basis for calculating the amount of adulteration of a given sample of butter.

According to the experiments given under Nos. 1—13, the amount of K H O necessary to saponify 1 gramme butter or clarified butter, varies between 221.5 and 232.4 milligrammes. We may, therefore, pass butter as pure, 1 gramme of which

requires 221·5 milligrammes or more of K H O for saponification, but as impure if it combines with less K H O. For calculating the amount of admixed foreign fat, the mean of the two extreme values found for butter, namely 227, will probably be best. If we call X the percentage of admixed fat, and N the number of milligrammes of K H O, which the sample of butter under examination requires for saponification, we obtain

$$(227 - 195\cdot5) : (227 - n) = 100 : x; \text{ and } x = (227 - n) \times 8\cdot17.$$

In the calculation of the percentages of admixed foreign fats similar differences are found, owing to variations between various samples of butter, as in the method of Angell and Hehner. If, for example, in calculating experiment No. 23, we take for butter the lowest figure, viz., 221·5 then X = 29 per cent. But if we take the highest, viz., 232·4, the result is 50 per cent., and by using the mean 227, the admixed foreign fat would come to 40 per cent. We might, therefore, if we calculate with the mean number of 227, make a mistake of 10 per cent. Under the most unfavourable condition, 29 per cent. foreign fat might escape detection; namely, if butter which required 232·4 milligrammes K H O has been employed, and the adulterated butter requires 221·5 milligrammes K H O for saponification. By using Angell and Hehner's method, 40 per cent. might, under these conditions, escape detection.

Irrespective of the ease with which butter may be examined by this new method, it will in some cases also furnish an insight into the constitution of fats.

Besides this, this method may give a means of distinguishing between fats for which the proportions of K H O necessary for saponification differ sensibly. Thus, in the above experiments on olive oil and colza oil, the numbers 191·8 and 178·7 were obtained, differing by 13·1. If once the extreme values have been fixed by a sufficient number of experiments for these two oils, we may use the difference between the numbers so fixed, not only for the detection of an adulteration of olive oil by colza oil, but also for calculating approximately the amount of adulteration.

I reserve for a future time the continuation of the experiments on fats in this direction, and the publication of the results in due course.

FIUME, November, 1878.

## A NEW METHOD OF DISTINGUISHING BUTTER FROM SOME OTHER FATS.

By WILLIAM GUSTAVUS CROOK, *Public Analyst for Norwich.*

HAVING been lately specially engaged in examining several kinds of fat for the purpose of identification, I will, as briefly as I am able, describe a method arrived at, which will in a few minutes distinguish butter from the fat of beef, mutton, or pork, or mixtures of them. The sample to be examined (if in the form of butter) must be first melted and rendered pretty free from water and salt, by filtration if necessary; ten grains are then to be put into a test tube, and liquified by placing the tube in hot water at about 150° F.; remove the tube when ready, and add thirty minims of carbolic acid (Calvert's No. 2 acid, in crystals, one pound; distilled water, two fluid ounces). Shake the mixture, and again place it in the water-bath until it is transparent. Set the tube aside for a time. If the sample thus treated be pure butter, a perfect solution will be the result; if beef, mutton, or pork fat, the mixture will

resolve itself into two solutions of different densities, with a clear line of demarcation: the denser of the two solutions, if beef fat, will occupy about 49·7; lard, 49·6; mutton, 44·00 per cent. of the entire volume; when sufficiently cooled, more or less deposit will be observed in the uppermost solution. If olive oil be thus tested, the substratum will occupy about 50 per cent.; with castor oil, there is no separation. With some solid fats (not likely to be used fraudulently) no separation whatever takes place; the addition of a minute portion of alkanet root will render the reading of the scale extremely distinct by artificial light. The above method (although not intended to surpass other processes) is capable of wide application, the saving of a large amount of time, and the reliability of its results will at once recommend it as a "first step" in butter analysis.

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#### INSTITUTE OF CHEMISTRY.

WE have received the reports of the discussions which took place on 27th February and 2nd April, on the subject of the Adulteration of Food. We believe this is the first work, partaking in any degree of a scientific character, which has been undertaken by the Institute since its formation; and it would, therefore, be hardly just to criticise the matter as closely as the proceedings of an older society, and the more so because by reason of the mistaken preference which the Institute has shown for secret meetings, and the rigid exclusion of visitors, several chemists who could have given really useful information were unable to be present. We suppose that this rule will be relaxed in future, since it seems improbable that the Council will exclude visitors from hearing what they can afterwards read, unless indeed the accommodation should prove to be too limited for the members attending. This, however, seems unlikely.

The discussion was opened by Dr. Voelcker, whose speech extends to some thirteen pages; we can, therefore, only briefly notice some of its salient points. Dr. Voelcker said there was no difficulty in determining "whether milk had been adulterated with a considerable quantity—say 20 per cent.—of water, or whether skimmed milk had been sold as fresh." "In cases of that kind, the chemical or microscopical examination of the articles in question decides, with certainty, whether they are genuine or adulterated." This, however, hardly accords with a statement a few lines lower. "I need hardly say that it is now admitted by all persons who possess some knowledge of dairy matters that the composition of equally genuine samples of milk varies greatly." The speaker then went on to refer to his old milk experiments at Cirencester, in 1863, and again quoted his analyses of the milk from the half-starved cows, bringing the produce of these wretched animals forward to show how variable milk is. He then referred to the limits laid down some years ago by the Society of Public Analysts, calling them, however, by the erroneous name of "standards." After acknowledging that some analysts, "no doubt very young and inexperienced," had challenged the accuracy of his analyses, he said that the "best informed" of his opponents had altered their views on the milk question, and come round to his own. After a well-deserved passing sneer at half-crown milk analysts, Dr. Voelcker stated that he objected *in toto* to all milk standards, and characterised the present one as "somewhat low." Four pages of the report are then occupied with a reprint of part of an old

paper on the importance of the hydrometer for determining the adulteration of milk, and another page with an old paper on cream. Dr. Voelcker, carefully avoiding making any remarks which were capable of criticism in reference to butter, bread, tea, coffee, cocoa, or arrowroot, referred to the well-known selenite water used in making the Worcester vinegar; and then passing rapidly over colouring matters, metallic poisons, salicylic acid, and spirits, concluded by pointing out what in his view was the absurdity of fining a man for 80 grains of salt per gallon in beer.

The President (Dr. Frankland) followed with a few remarks, of which the most novel was the statement that, in taking the specific gravity of milk, "the quantity of fat present would exercise no influence on the indications of the lactometer."

Dr. Dupré pointed out the error into which Dr. Voelcker had fallen, in calling the limits fixed by the Society of Public Analysts "standards," and remarked on the special attention which had been paid to these limits in Germany as compared with the consideration they had received in England. Referring to the milk question, he remarked that milk from under-fed cows was certainly not of the nature, quality, and substance demanded. He considered that Dr. Voelcker's analyses of the milk of such cows had done much harm. In reference to alumina in bread he considered it impossible to lay down a proper limit, except by the comparison of the silica with the alumina present. He pointed out that in the case of flour it was easy to determine the alum by means of his process, already published in THE ANALYST. Referring to butter, Dr. Dupré again pointed out the fallacious inferences which may be drawn from the sp. gr. only, when mutton fat has been used as an adulterant, and urged the necessity of the determination of both insoluble and soluble acids. With reference to the fines inflicted by some magistrates he remarked that, by the addition of only 10 per cent. of water to the milk consumed in London, the sum of £150,000 a year would be paid for water. He concluded with a few observations as to the changes which may take place in drugs by long keeping.

Dr. Stevenson regretted that Dr. Voelcker's paper referred to so few subjects, and introduced so little new matter; he believed that Public Analysts as a body were as trustworthy as the members of any other profession. He thought it would have been well had Dr. Voelcker's analyses been made by modern methods instead of by methods now scarcely ever adopted by analysts, and considered that the milk of fairly-fed cows did not present that wide difference which they had heard of that evening.

Dr. Redwood thought that spirits should be kept within certain limits, in order to justify the application to them of their popular names. He appeared to think that 80 U.P. was a fair and proper strength for gin, and that lower than that should not be allowed. He justified the addition of annatto to butter and cheese for the purpose of colouring them, but condemned the colouring of pickles with copper.

Dr. Tidy objected to a standard in which the analysis of any article as a whole was not taken account of. He stated that, on referring to Dr. Letheby's old note books, he found that he (Dr. Letheby) examined the milk yielded by two cows for 115 consecutive days. The solids not fat in the milk of one cow never fell below 9 per cent., but in the milk from the other cow, on four different occasions, the amount of solids not fat was less than 7.5 per cent. He thought, however, there were ninety-nine chances in a hundred that milk which gave such a figure as this was adulterated. He gave some

interesting statistics as to the average total solids found in human milk in health and disease, which led him to the opinion that in some cases the children of diseased women appeared to thrive on milk which contained far less total solids than in other cases where the proportion was abnormally high.

Mr. Bell stated that at Somerset House they did not subscribe to the limits laid down by the Society of Public Analysts, because having taken great trouble to investigate the subject of milk, they had found considerable variations in its composition, and that no one constituent forms a constant quantity in genuine milk. In judging whether a milk had been watered or not they took the whole of the constituents into account, and formed from these an opinion as to the genuineness or otherwise of the sample.\* Mr. Bell then gave some statistics of the examination which they had made of the character of various samples of milk, which are no doubt of interest, but would have been more so had they been given in a rather more intelligible form. The net result appears to be, that in the case of individual cows 4 per cent. yielded less than 11 per cent. of total solids, and 18 per cent. less than 8·6 per cent. of solids not fat; while in the case of dairy mixture 20 per cent. showed less than 12 per cent. of total solids, and 12 per cent. contained less than 8·6 per cent. of solids not fat. In the case of individual cows only 6 per cent. yielded less than 2·5 per cent. of fat, and in the case of dairy mixtures only 4 per cent. were found to contain under 3 per cent. of fat. Mr. Bell evidently considered the Society's limit of 2·5 per cent. fat in milk too low. It appears to us a singularly unfortunate thing, that when Mr. Bell was asked to meet the Society of Public Analysts, in order to give them the very information contained in this speech, and to discuss the matter with those who are presumably most capable of dealing with the subject, he should have sheltered himself behind a letter from the Inland Revenue Commissioners stating that they did not "think it expedient" he should meet the Society, and then that Mr. Bell should have brought these statistics forward on an occasion when they could scarcely be discussed with equal knowledge or authority. After a few remarks with reference to the question of salt in beer the discussion was adjourned.

In resuming the discussion on April 2nd, Professor Attfield said he thought a good deal more should be done towards settling the limits or standards. After hearing the remarks of Dr. Voelcker and Mr. Bell, he thought they ought to be revised. He could not subscribe to the statements of the Society. Professor Attfield then criticised at some length the "limits" of the Society, asking whether even salt must be sold free from arsenic.

A communication was then read from Mr. Angell on the subject of milk, supporting the Society's standard of 9·0 solids not fat.

Mr. Helmer somewhat severely criticised Dr. Voelcker's and Mr. Bell's figures, and pointed out that it was incredible that Public Analysts all over the country should have made such an erroneous estimate as 9·0 of solids not fat in milk, as was

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\* We fancy this remark of Mr. Bell's must be misreported, for a copy of a certificate relating to a milk sample is now lying before us signed by Mr. Bell and his coadjutors, and bearing a date in last month, in which certificate no determination of ash is given, and no estimation of the constituents contained in that ash, and this notwithstanding that the milk had been condemned by a Public Analyst, partly because salt or other preservative material had been added to it.—EDITORS ANALYST.

implied by Mr. Bell's statements. He also denounced the sp. gr. of fat process as unreliable for butters, and traced the high percentage of fatty acids sometimes found at Somerset House to imperfect washing. He concluded by protesting against "secret" methods of analysis.

Dr. Dupré pointed out that in every case in which he had received a milk containing less than 8.6 per cent. solids not fat, he had given a certificate of adulteration; and in all those cases a prosecution had ensued, and a fine had been inflicted and paid; a pretty conclusive proof that the vendors did not dare to appeal. He then brought forward some experiments which entirely controverted the remarks of the President as to the effect of cream on the hydrometer.

Dr. Alder Wright made a few remarks in reference to the hydrometer to the same effect.

Mr. Neison put the hydrometer question in a still more intelligible form, and pointed out that it was simply a measure of the weight of the column of liquid above it.

Mr. Bannister referred to certain articles in *THE ANALYST*, to show that the term standards was sometimes used instead of limits even in this journal; but his quotation seems to us to apply really to Mr. Wanklyn's "standard," not to the Society's "limit." He then referred to two well-known old cases in which analysts had unquestionably made mistakes, both of which cases were immediately and promptly dealt with by the Society of Public Analysts. Of this latter fact Mr. Bannister made no mention.

After a few remarks from Dr. Dupré, expressing surprise at some remarks of Mr. Bannister's, Mr. Helm did little more than reiterate Mr. Bell and Mr. Bannister's statements in reference to milk. He complained however of the low fines when samples were proved to be adulterated, and introduced a personal element into the matter, by pointing out that his own milkman had just been fined.

After Mr. Bell had again defended the sp. gr. test for butter, Dr. Alder Wright said he thought the amount of added water should be calculated from the limit used in the case of milk, and not from the average results of general samples; but, from his remarks, it would appear that he did not understand that this was the course almost invariably taken by Public Analysts. He then referred again to the hydrometer, and clearly showed that the statements first made about it were incorrect.

The President, in his concluding remarks, appeared to think that the troublous times of the Public Analysts were coming to a conclusion, and that chemists were rapidly converging to fairly unanimous opinions as to the processes and limits or standards. He thought there should be a difference between the fine inflicted upon the man who intentionally adds water to his milk and the man who sells milk from a poor cow; and therefore he thought there should be two standards, one of average quality and one of minimum, and that any milk falling between the two should be regarded not as adulterated but as not of the quality demanded. The President then made some rather strong remarks in reference to low fees paid for analytical determinations, such for instance as 2s. 6d. or 5s., and the discussion was concluded with a vote of thanks to Dr. Voelcker, and its acknowledgment by him.

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#### SALE OF FOOD AND DRUGS ACT (1875) AMENDMENT BILL.

The following is a Copy of the Bill introduced into the House of Commons by Mr. Anderson as amended by the Select Committee.

WHEREAS conflicting decisions have been given in England and in Scotland in regard to the meaning and effect of section six of the Sale of Food and Drugs Act, 1875, in this Act referred to as the principal Act, and it is expedient, in this respect and otherwise, to amend the said Act: Be it enacted by the

Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows :

1. This Act may be cited for all purposes as the Sale of Food and Drugs Act Short title. Amendment Act, 1879.

2. In any prosecution under the provisions of the principal Act for selling to the prejudice of the purchaser any article of food or any drug which is not of the nature, substance, and quality of the article demanded by such purchaser, it shall be no defence to any such prosecution to allege that the purchaser, having bought only for analysis, was not prejudiced by such sale. Neither shall it be a good defence to prove that the article of food or drug in question, though defective in nature or in substance or in quality, was not defective in all three respects.

In sale of adulterated articles no defence to allege purchase for analysis.

3. Any street or open place of public resort shall be held to come within the meaning of section seventeen of the principal Act.

Extension of Act as to sale in streets, &c.

4. In determining whether an offence has been committed under section six of the said Act by selling, to the prejudice of the purchaser, spirits not adulterated otherwise than by the admixture of water, it shall be a good defence to prove that such admixture has not reduced the spirit more than twenty-five degrees under proof for brandy, whisky, or rum, or thirty-five degrees under proof for gin.

Reduction of spirits allowed to the extent of 25 per cent. under proof.

5. Every liberty having a separate court of quarter sessions, except a liberty of a cinque port, shall be deemed to be a county within the meaning of the said Act.

Extension of meaning of "county."

6. The town council of any borough having a separate court of quarter sessions shall be exempt from contributing towards the expenses incurred in the execution of the principal Act in respect of the county within which such borough is situate, and the treasurer of the county shall exclude the expenses so incurred from the account required by section one hundred and seventeen of the Municipal Corporation Act, 1835, to be sent by him to such town council.

Quarter sessions boroughs not to contribute to county analyst.

7. The town council of any borough having under any general or local Act of Parliament, or otherwise, a separate police establishment, and being liable to be assessed to the county rate of the county within which the borough is situate, shall be paid by the justices of such county the proportionate amount contributed towards the expenses incurred by the county in the execution of the principal Act by the several parishes and parts of parishes within such borough in respect of the rateable value of the property assessable therein, as ascertained by the valuation lists for the time being in force.

Provision for boroughs with separate police.

8. In all prosecutions under the principal Act, and notwithstanding the provisions of section twenty of the said Act, the summons to appear before the magistrates shall be served upon the person charged with violating the provisions of the said Act within a reasonable time, and in no case exceeding twenty-eight days from the time of the purchase from such person for test purposes of the food or drug, for the sale of which in contravention to the terms of the principal Act the seller is rendered liable to prosecution, and particulars of the offence or offences against the said Act of which the seller is accused, and also the name of the prosecutor, shall be stated on the summons, and the summons shall not be made returnable in a less time than seven days from the day it is served upon the person summoned.

Special provision as to time for proceedings.

### CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

TO THE EDITOR OF "THE ANALYST."

SIR,—My short "Note on Violet Powder" evidently contains some wholesome truths which have proved very unpalatable to various of your readers, since their anger has made them forget logic, fairness, and even ordinary propriety. With such I can of course not enter into any discussion, but I would ask for space to assure your correspondents, "The Manufacturers of the Steamer Over a Globe Violet Powder," that I am not above learning even from manufacturers of scented selenite powder. If they will, therefore, kindly point out the fallacies and erroneous conclusions contained in my Note, I will carefully consider their statements, and should I find them correct will alter my own accordingly.

I must, however, at once protest against the assertion that I have included arsenic as among the constituents of various violet powders.

I remain, yours, &c.,

A. DUPRÉ.



## TO THE EDITOR OF "THE ANALYST."

SIR,—As you have called upon me to produce whatever evidence I may have relating to the nature of the saccharine substances contained in malt wort, and to the detection of cane sugar in wort, will you give me space to say that I have for a long time past been actively engaged in investigating the matter, and have notes of a very large number of experiments, showing, analytically, that the sugar of wort is *maltose*, not glucose. But, since my experiments cannot be compressed into the narrow compass of a letter, I trust to be allowed to give them at length at an early meeting of the Society of Public Analysts.

As far as I could ascertain, the method adopted by the Somerset House chemists to determine the quantity of cane sugar in wort consists in boiling the wort for a few minutes with a little dilute sulphuric acid, by which treatment dextrin is said not to be affected, cane sugar being converted into glucose, the increase in the amount of saccharine matter capable of reducing Fehling's solution being calculated as cane sugar.

How faulty and untrustworthy this method is, especially when only comparatively small quantities of cane sugar are in question, I am ready to show.

I remain, yours obediently,

OTTO HEHNER.

## THE BATH MILK PROSECUTION.

WITH reference to this case, reported on another page, our readers will probably be interested in the results of Mr. Gatehouse's experiments, as detailed in the following report:—

The City Analytical Laboratory, 36, Broad Street, Bath, May 9th, 1879.

I, the undersigned Public Analyst for the city and borough of Bath, hereby certify that on Thursday, May 1st, 1879, Mr. Francis, of Compton Dando and the Bath Market, brought to my laboratory a tall can (about four feet high) full of milk for experimental investigation. This milk at 9.15 a.m. he proceeded to transfer in my presence into another vessel by means of an ordinary tin milk cup, dipping at intervals of a few minutes so that in the course of two and a half hours he had transferred in this manner 25 quarts, being about one-half the quantity originally in the tall tin. He also at the same time delivered to me a bottle of milk taken from the same tin at the time it was put therein at his farm. Having analysed the milk in the bottle and also samples of that taken from the tin when first opened and when the dipping was completed, I found the following results:—

Milk from the bottle as originally placed in the tin.	Milk from the top of the tin as received at 9.15 a.m.	Milk remaining in the tin at 11.50.
Water..... 86.92	Water..... 74.20	Water..... 89.50
Fat..... 3.2	Fat..... 16.03	Fat..... .78
Solids not fat .. 9.88	Solids not fat .. 9.77	Solids not fat .. 9.72
Cream..... 15 per cent.	Cream..... 95 per cent.	Cream..... 4 per cent.

On Monday, May 5th, Mr. Francis at my request supplied me with eight quarts of milk in a milk can of ordinary construction, as used for selling milk in the streets. Five quarts of this milk I transferred during a space of three hours by dipping at intervals of a few minutes *from the top of the milk*, so as to disturb the cream as little as possible, and made the three following analyses of different portions thereof:—

8.15. Milk as originally in the tin.	Milk taken from the tin at 10.45.	Milk remaining in the tin at 12.15.
Water..... 87.4	Water..... 87.3	Water..... 87.55
Fat..... 13.2	Fat..... 3.4	Fat..... 2.8
Solids not fat.. 9.4	Solids not fat... 9.3	Solids not fat... 12.45
Cream..... 13 per cent.	Cream..... 15 per cent.	Cream..... 9 per cent.

From these facts I conclude:—1. That the milk originally placed in the tall tin, received by me on May 1st, was of excellent quality. 2. That this milk had been standing in the tin for a considerable time before it was received, and that its removal from place to place was not sufficient to prevent the cream rising to the surface and remaining there. 3. That by selling milk from such a tin without taking care to mix the contents occasionally, the milk is ultimately reduced to the state of "skim milk," losing the greater part of its fat by the cream rising. 4. That by selling milk from the ordinary open tin in the usual manner, no appreciable difference occurs in the quality of the milk.

(Signed)

J. W. GATEHOUSE.

Mr. J. Napier has been appointed Public Analyst for Bury St. Edmunds.

Mr. W. W. Stoddart has been appointed Public Analyst for the Borough of Chard.

Dr. W. Morgan has been appointed Public Analyst for the Borough of Neath.

## LAW REPORTS.

**SPIRITS OF NITRE AND CREAM OF TARTAR.**—John Pennock, grocer, of Norton, was charged at the County Petty Sessions, at Stockton, with selling adulterated spirits of nitre and cream of tartar. Mr. C. H. Archer, of Stockton, defended. Supt. Bell, inspector under the Act, stated that on the 4th February he purchased six ounces of spirits of sweet nitre at the defendant's shop. He told the defendant it was for purposes of analysis. He divided it into three portions, one of which he gave to the defendant, the second he retained, and the third he sent to Mr. Edger, of Newcastle, the County Analyst, who certified it to contain 25 per cent. more water than genuine nitre contained. There was a fair proportion of nitrous ether. On the same day he purchased four ounces of cream of tartar, and the same process as mentioned in the first case was gone through. Mr. Edger certified the article to contain an excess of tartrate of lime—tartrate of lime, 8.5 per cent.; sand, 1.2 per cent.; sulphate of baryta, 17 per cent. He produced the analyst's certificate in each case. Mr. Archer said that in the first case his defence was that although the nitre was of inferior quality it was a commercial article, and of the quality usually sold. The first quality of nitre was seldom produced, the second was usually sold in town, and the third was generally sold in the country for cattle. Mr. Bell paid for an inferior article, and he was entitled to no better quality than he got. Mere inferiority was no ground on which to convict a man under the Act, and he therefore asked the bench to dismiss his client. As to the cream of tartar, the tartrate of lime was left in through the mode of production; and the article, like the nitre, was sold precisely as it was got in the first instance. Mr. Dodgson, of the firm of Mandale, Dodgson and Co., bore out Mr. Archer's remarks as to the nitre, and added that people objected so much to paying for a superior quality that it was seldom offered; cream of tartar, he explained, was produced from the crust of wine. The crust of red wine was cleared by means of white clay, and there usually remained a certain amount of tartrate of lime, and not unfrequently a small quantity of the clay. He supplied the defendant with the nitre, and the cream of tartar. Supt. Bell: And of course you are consequently anxious that there should be no conviction. The bench said they were satisfied that there had been an infringement of the Act, but it was not a serious one. They fined the defendant 1s. and costs in each case. J. Clay, general dealer, of Norton, was also charged with selling adulterated nitre. Supt. Bell stated that in this case the analyst had certified the sample to contain 24 per cent. more water than was contained in genuine nitre. Cream of tartar purchased at the defendant's was found to be much better than that sold by Mr. Pennock; it was nearly pure, and a summons had, therefore, not been taken out.—The Defendant said he sold the nitre exactly as he got it from the wholesale grocers. The Bench: We fine you 1s. and costs. You must not sell any more of this unless you tell people what it is.

**ALUM IN BREAD.**—George Allen, baker, of Walsall, was summoned at the instance of Mr. C. W. Stephens, sanitary inspector, for selling an article of food not compounded of the ingredients demanded, and also for selling bread containing alum, so as to be injurious to health. The inspector stated that he purchased a two-pound loaf at the shop of defendant, and forwarded it to Mr. E. W. T. Jones, the Borough Analyst, whose certificate of analysis he produced. The certificate showed that the loaf was adulterated with alum in the proportion of 36 grains to the four-pound loaf, and that such adulteration would tend to render the bread indigestible. Dr. J. Maclachlar, medical officer of health, gave it as his opinion that the quantity of alum stated would be likely to make bread injurious to health. Addressing the Bench for the defence, Mr. Nanson said he did not dispute that there was alum in the loaf, but he urged that none was put in by the defendant or at his establishment, and that the flour was used just as it came from the miller. The Bench, after hearing the defendant, considered the case proved, and imposed a fine of £5 and costs (including professional charges), on the first summons, the other being withdrawn. The fine and costs amounted to £7 14s.

**ADULTERATING MILK.**—William Berridge, farmer, of Duntox Bassett, near Lutterworth, Leicester, was summoned for selling milk adulterated with water. Mr. Ricketts, solicitor, prosecuted on behalf of the Metropolitan Dairymen's Society; Mr. Louis Lewis appeared for the defence. Mr. Ricketts said that the prosecutor in this case—Mr. Thomas Gibson, of Walbrook Dairy, East Road, City Road—was a member of the Dairymen's Society, and had contracted with the defendant to supply him with milk every day, which was delivered at the Midland Railway terminus. In consequence of some suspicion which he entertained as to the quality of the milk he communicated with the society's officer. Mr. Parish, who took a sample of some of the milk in a bottle on its arriving at the St. Pancras Station, when it had become the property of Mr. Gibson. The sample was taken to Dr. Stevenson, Public Analyst, who, upon examining it, found it to be adulterated with 14 per cent. of added water. Witnesses having been called to bear out Mr. Ricketts's statement, Mr. Barstowe said this was the kind of offence he wished to get hold of. As there appeared to have been no complaints made in the neighbourhood where

the defendant carried on his business, he would inflict a somewhat mitigated penalty. He had power to impose a fine of £20. The costs had been heavy in this case, and amounted to £10 10s. and this, with a fine of £5, was the penalty he would inflict. The fine was at once paid.

**SKIMMING MILK.**—At the Bath Police-court, before the Mayor and other magistrates, Henry Francis, dairyman, of the Market, was summoned for selling milk, which was not of the nature, substance, and quality demanded. Mr. F. H. Moger and Mr. F. S. Clark defended. Mr. Moger stated that Inspector Montagu, on the 8th May, bought at a stall, which defendant kept in the market, some milk. Mr. Montagu informed the person in charge of the stall that it was purchased for the purpose of being analysed, and divided the sample into three parts. The inspector took a portion to the Public Analyst, Mr. Gatehouse. The certificate of Mr. Gatehouse certified that "I received, on the 8th day of April, 1879, of Mr. H. G. Montagu, a sample of milk in a sealed bottle, labelled No. 5, signed H. G. M., for analysis, which then weighed seven ounces, and have analysed the same, and declare the result of my analysis to be as follows:—Water, 89·79; fat, 1·13; casein, sugar, &c., 8·40; ash, ·68; cream, 4 per cent. by volume. I am of opinion that the same is a sample of milk which is deficient in fat to the extent of 55 per cent." Mr. Gatehouse was examined in support of his certificate; and the defendant was then called, and accounted for the absence of fatty matter by constant dipping in the can which contained the milk, and from which milk had been sold four and a-half hours before the sample in question was taken from it, and undertook to supply Mr. Gatehouse with a can of milk to experiment upon, Mr. Gatehouse considering that the constant dipping would, to a certain extent, mix the cream with the milk. After consulting privately together, the Mayor announced that the Bench could not agree on a decision, and therefore the case would be dismissed.

#### NOTES OF THE MONTH.

The unintentional skimming of milk (first brought forward as a good defence in cases where a milkman was charged with selling skimmed for fresh milk, on the occasion of a certain learned professor's now historical ride in a milk cart) has again cropped up in Bath; and in an elaborate report, Mr. Gatehouse has concluded that, under certain circumstances, such involuntary fraud is quite possible. In the face of this defence, it is certain that no prosecution for skimming milk can ever lie, but, in the interests of the public, we would suggest that when it is next offered, the prosecution should argue that an essential point in the business of a purveyor of milk is to use such vessels and such precautions as will secure that his final customers shall not be robbed to the advantage of the first; and that, no matter whether it be done wilfully, or only by want of due precaution, the offence of selling to the prejudice of the latter purchasers remains the same, and conviction should follow. Of course, if the magistrate is satisfied that it was a case not of criminal intent, but only of contributory negligence, then he can take that as a plea *ad misericordiam* in fixing the fine.

A recent case in which a sample of milk was sent to Somerset House for analysis throws some light on the differences in the deductions which the Inland Revenue chemists have drawn from their analyses, and those obtained by Public Analysts.

A sample of milk was analysed by a Public Analyst in April. In May the sample was sent to Somerset House, but previously to sending it the bottle was opened by the inspector, and a portion of its contents removed by him in the presence of two analysts, one of whom examined the portion removed. The bottle was then re-sealed by the inspector, and forwarded the same day to the Inland Revenue Laboratory. The results obtained were as follows—

	First Analyst.	Second Analyst.	Somerset House.
Solids not fat .. ..	7·78	7·58	7·14
Fat .. ..	2·50	2·42	2·38
Ash .. ..	·87	·86	Not determined.
Cl. in Ash .. ..	·23	·22	ditto.
Opinion .. ..	15 % water.	15 % water.	10 % water.

The interest of the analyses lays mainly in the fact that the second analyst and the Somerset House chemists received the sample within a few hours of each other. It was then a month old, and the difference between the first and second columns shows the change it had then undergone, but the Somerset House chemists find, either on the same day or the next, ·44 less solids not fat than No. 2 analyst; or as nearly as may

be the same difference as exists between their standard results and the results of Public Analysts generally. This points to the source of the discrepancy: their solids not fat are evidently dried at too high a temperature, or too long.

We have pleasure in drawing the attention of our readers to the abstract which we print of the discussion which took place before the Institute of Chemistry on the subject of Food Adulteration, and we write this none the less sincerely, although we note with regret that but little new matter was brought forward by the various speakers. Indeed, the most striking feature in the whole discussion seems to have been, in the first instance, an attempt to ignore all the work which had been done by the Society of Public Analysts, although it amounted to as many thousands of analyses as the number of speakers present could claim to have made hundreds. After a short time, however, it became evident that the work of Public Analysts must be referred to, notwithstanding this attempt to ignore it, and we certainly have nothing to complain of in the criticism which it received. Coming from such a quarter, the criticism was sure to be severe, but that seems to us immaterial, for no statement put forward by the Society as a definite fact appears to have been in any way disproved. It would have been much better if the discussion had been an open one, so that a little new information might have been thrown on the subject.

*Apropos* of this discussion, it is a very singular thing that the President of the Institute should appear to think that Public Analysts, as such, are the gentlemen who are under-bidding, and therefore lowering the status of the profession. Practically, this is not so. We do not know of a single instance in which a Public Analyst does not get remuneration—say, for instance, for milk analyses—which is not above that accepted by some persons—it may be even by members of the Institute itself—for analyses of samples from private customers. True, the 2s. 6d. fee is named in the Act, but this fee is meant to be, and practically is in every case, supplemented by a respectable yearly salary. Is this the case always in reference to private work? Could not the Institute take this subject up and look carefully into it? Some of its influential members would be able to give important and valuable information on this point, even though they fairly and honestly admit their lack of experience in reference to food analysis.

#### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price.
2776	W. Weldon .. .. .	Manufacture of Soda and Potash .. .. .	4d.
3621	W. Weldon .. .. .	Manufacture of Alkaline and Earth Metal Cyanides ..	2d.
2840	P. Spence and T. Illingworth ..	Manufacture of Sulphate of Ammonia .. .. .	2d.
3897	H. Kenyon .. .. .	Purifying Coal Gas and Manufacturing Carbonate of Ammonia .. .. .	2d.
3844	C. M. Sombart .. .. .	Producing Iodine and Bromo .. .. .	4d.
3900	E. G. Brewer .. .. .	Manufacture of Cements .. .. .	2d.
3917	J. H. Johnson .. .. .	Apparatus for Compressing Ammoniacal and other Gases .. .. .	6d.
3967	J. Imray .. .. .	Manufacture of Potassa and Soda Carbonates from Potassium and Sodium Chlorides .. .. .	6d.
3973	G. Glover .. .. .	Destroying, &c., Deleterious Compounds formed during Manufacture of Soda Ash .. .. .	4d.
4003	A. McDougall and J. Hepworth ..	Purification of Gas and Separation of products therefrom .. .. .	2d.
4019	A. Rowan .. .. .	Manufacture of Cement .. .. .	2d.
5255	W. Morgan-Brown .. .. .	Phosphorescent Powders, &c. .. .. .	6d.

#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; The Anti-Adulteration Review; Journal of Applied Science; The Boston Journal of Chemistry; The Dairyman; The American Dairyman; The Practitioner; American New Remedies; Proceedings of the American Chemical Society; Le Praticien; The Inventors' Record; Estimation of Phosphoric Acid and Magnesia, by Messrs. Teschemacher and Denham Smith; Organic Chemistry, by Hugh Clements; Analytical Notes by Dr. Bernays.

# THE ANALYST.

JULY, 1879.

## SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING of this Society was held at Burlington House, Piccadilly, on Wednesday, June 4th, the President, Dr. Muter, M.A., F.C.S., in the chair.

The minutes of the previous meeting were read and confirmed.

Mr. W. F. H. Pocock, Analytical Chemist of Cape Town, Cape of Good Hope, was proposed for election as a Member.

Dr. Dupré gave notice of his intention to propose a Resolution at the next Meeting in reference to the appointment of a Foreign Secretary.

Dr. Dupré read a paper "On the Examination of Spiritus Ætheris Nitrosi."

Mr. Wigner read a paper by Mr. J. Carter Bell, "On the Analysis of Flour and Bread."

And also a paper by Mr. A. Wynter Blyth, "On the Analysis of Devonshire Cream."

The next Meeting of the Society of Public Analysts will be held at Sheffield, during the Meeting of the British Association, early in August next.

## NOTE ON THE EXAMINATION OF SPIRITUS ÆTHERIS NITROSI.

By A. DUPRE, Ph.D., F.R.S.

*Read before the Society of Public Analysts, on 4th June, 1879.*

HAVING at various times been asked for explanations as to the method I use for estimating the amount of nitrous ether, contained in a sample of Spiritus Ætheris Nitrosi, I take this opportunity of describing the method once for all. The principle of the method will be found in *Duflos Apothekerbuch*, Edition 1867, p. 251, and I have simply worked out the details a little more fully. For the present I confine myself to the analytical method, and must leave many points of interest connected with the subject to some future time.

Spiritus Ætheris Nitrosi, as is well known, is directed to be prepared (*Brit. Pharm.*) by distilling a mixture of spirit, nitric and sulphuric acids and copper, and mixing the distillate obtained with a certain proportion of spirit. If all the nitric acid employed were used up in the formation of nitrous ether, the proportion of such contained in the finished product, if two pints of spirit are added to the 15 ozs. of distillate, would amount to about 6.5 per cent. In practice this result is, however, never obtained; and, according to my experience, we may consider a product containing 3 per cent. of nitrous ether as fairly representing the B.P. preparation.

In judging of the purity, or otherwise, of any given sample of Spiritus Ætheris Nitrosi, B.P., the particular method of manufacture adopted in the preparation of the

sample is, of course, perfectly immaterial ; as long as it fairly corresponds in strength to the B.P. standard, it must be considered as of the nature, substance and quality demanded, however produced.

*Characters.* B.P. Transparent, very slight tinge of yellow. Specific gravity, 0.845. Effervesces feebly, or not at all, when shaken with a little bicarbonate of soda. When agitated with a solution of sulphate of iron, and a few drops of sulphuric acid, it becomes olive brown or black. If it be agitated with twice its volume of saturated solution of chloride of calcium in a closed tube, two per cent. of its original volume separate in the form of nitrous ether, and rise to the surface of the mixture.

*Further Tests of Purity.* Should give no precipitate with nitrate of silver ; absence of hydrocyanic and formic acids. A small quantity poured on a little water, and ignited, should leave an aqueous solution, which gives no precipitate with nitrate of silver ; absence of hydrochloric ether, chloride of ethylene, &c.

The chloride of calcium test is not of much value. Firstly, because only those samples respond to it which are nearly of the proper strength, and no information is gained as to the composition of those samples, from which nothing separates, except of course that they are below the proper strength. Secondly, because the substance separating though chiefly, is not by any means only, nitrous ether. The iron test may be used as a rough quantitative test by using a sample of known strength for comparison, and it offers a very ready means, before a magistrate for example, to show the character of any impugned sample.

*Estimation of Nitrous Ether.* Ten cubic centimetres of the ether are introduced into a small flask already containing about 1.5 grammes of solid potash hydrate. The flask is closed with a well-fitting cork, gently agitated from time to time to promote solution of the potash, and left standing over night. Next day the contents of the flask, more or less yellow according to the amount of aldehyde present, are washed into an evaporating basin with 50 c.c. of water, and the mixture evaporated on a water-bath to about half or one-third. The remainder is allowed to cool, filtered through a little glass wool into a beaker made up to 300 c.c. with water, 50 c.c. of diluted sulphuric acid (1 in 4) are added, and the nitrous acid present determined by a standard solution of permanganate. This standard solution is prepared by dissolving 8.475 grammes of pure permanganate of potassium (or its equivalent) in one litre water ; 1 c.c. of this solution is equivalent to 0.01 grammes of nitrous ether, and therefore indicates 0.1 per cent. of nitrous ether, if 10 c.c. of ether have been taken. The decolouration of the permanganate is rapid at first, gradually becoming slower. As soon as this is perceived not more than 0.5 c.c. are added at a time, and the process must be considered as at an end if the solution still shows a distinct pink or red colouration two minutes after such addition. For every cubic centimetre of permanganate solution then used, the Spiritus Ætheris Nitrosi contains, at a maximum, 0.1 per cent. of nitrous ether. The solution still continues to decolourise permanganate, though but slowly, and much more will have to be added before the colouration becomes permanent. I have however convinced myself, by many experiments, that all nitrous acid present is oxidised when the above indicated point is reached. No doubt other substances are

oxidised as well, and the process indicates more nitrous ether than is actually present ; but as the error is on the side of leniency, it is perhaps an advantage rather than otherwise. By following out strictly the directions here given, it will be found that duplicate analyses of a sample rarely differ more than 0.1 per cent. from each other ; while, with poor samples, the agreement is even more perfect. Should a sample require much permanganate, and the solution, instead of becoming colourless, remains brown or yellow, more sulphuric acid must be added.

If, instead of evaporating and filtering the alcoholic solution, it is at once diluted, acidified, and permanganate added, more of the latter will be required than in the former case. In good samples the difference is sometimes great, but in most poor samples it is but slight, and in such case this more rapid process may be adopted. I have also tried the process of adding at once an excess of permanganate, letting stand five minutes and estimating the excess remaining, but the results given are decidedly too high. Various other methods have been proposed for the estimation of the nitrous ether, but I do not propose to enter into such, as the process given fulfils, I believe, all necessary conditions.

It is stated in most works on the subject that nitrous ether is rapidly decomposed and becomes acid. The latter statement is correct, as far at least as ordinary Spiritus Ætheris Nitrosi is concerned, but the former is not in accordance with my experience. Spiritus Ætheris Nitrosi becomes acid mainly on account of the oxidation of the aldehyde it contains, while the nitrous ether present suffers but slow decomposition, at least when dissolved in spirit of sufficient strength. The following analyses will illustrate this. Sample I. was prepared by myself on February 21st, 1872, and has been kept ever since in a glass stoppered bottle (white glass) of one litre capacity which it filled about half at first. About one half of the neck of the bottle was broken off early in 1872, so that the stopper does not fit very tightly since. The bottle stood on a shelf in the laboratory exposed to ordinary diffused daylight, but never to direct sunlight. On the bench below, and near to where the bottle stands, a Bunsen gas burner is frequently in use. Sample II. was bought as a sample of Spiritus Ætheris Nitrosi (*Brit. Pharm.*) from a well known wholesale house on December 2nd, 1873. It was contained in the ordinary pint bottle of green glass, and stood ever since in a cupboard of the laboratory, or in other words chiefly in the dark. Both bottles were frequently opened, and small portions of ether taken out in the intervals between the analyses given :—

No. of sample.	Date of examination.	Specific gravity.	Corresponding alcoholic strength.	Total acid free as acetic acid.	Real nitrous ether.
I.	Feb. 21, 1872	·836	84.8 per cent. b. w.	0.10	2.00
„	Nov. 15, 1873	·839	83.6 „ „	0.90	1.98
„	April 23, 1879	·844	81.7 „ „	0.85	0.89
II.	Dec. 2, 1873	·824	89.5 „ „	1.19	1.35
„	April 15, 1879	·847	80.5 „ „	1.38	0.96

We see, therefore, that even under somewhat unfavourable conditions the

decomposition of the nitrous ether proceeds but slowly, and the plea sometimes advanced by chemists that the sample of Spiritus Ætheris Nitrosi obtained at their shops, and found wanting, had been kept for some time and had decomposed, may safely be set aside as untrue.

In conclusion, I give the analyses of a number of samples, every one of which was bought as Spiritus Ætheris Nitrosi (*Brit. Pharm.*), and should therefore have had a sp. gr. of 0·845, and contained about 3 per cent. of nitrous ether. All, except the last, were, however, bought before the present Sale of Food and Drugs Act came into operation. The last sample was supplied to the Westminster Hospital early in April, 1879. The bottle containing it, a Winchester quart, was labelled "Spiritus Ætheris Nitrosi, *Brit. Pharm.*, sp. gr. 0·845." The bottle was quite full, and had not been opened at the Hospital, the stopper being still tied over with bladder when I took the sample on April 23rd, 1879.

Specific gravity.	Corresponding alcoholic strength.			Total free acid as acetic acid.	Real nitrous ether.
0·908	..	..	54·05 per cent. b. w.	0·42 per cent.	0·23 per cent.
0·913	..	..	52·0	0·39	0·19
0·851	..	..	79	0·09	0·06
0·892	..	..	61·5	0·32	0·38
0·854	..	..	77·7	0·47	0·44
0·936	..	..	41·8	0·41	0·10
0·851	..	..	79	1·14	1·30
0·928	..	..	45·6	0·33	0·25
0·852	..	..	78·5	0·28	0·07
0·848	..	..	80	1·28	1·40
0·849	..	..	79·7	0·96	0·52

Mr. Hehner suggested that the direct addition of iodide of potassium would give a much fairer measure of the quantity of nitre present. He would add acetic acid and iodide of potassium, which both Dr. Muter and Mr. Wigner said they thought was a very good idea.

### ON THE ESTIMATION OF ETHYL NITRITE IN SPIRITUS ÆTHERIS NITROSI, B.P.

By JOHN MUTER, PH.D., F.C.S.

I HAVE been in the habit of using a saponification process for this spirit, but I work in a manner somewhat different from that used by Dr. Dupré, which I think possesses several advantages. The solutions I use are:—

(1). Decinormal solution of hyposulphite of soda (sodium thiosulphate), made exactly according to the directions of the British Pharmacopœia, each c.c. of which = ·0127 free iodine.

(2). Solution of potassium permanganate, containing 3·175 grammes per litre, and checked to balance the "hypo." solution, by adding excess of saturated solution of potassium iodide to 100 c.c., and then seeing that the iodine set free exactly requires 100 c.c. of "hypo." for complete decolourisation, starch paste being added as an indicator towards the end of the process.

I first take the specific gravity of the sample at 60° Fahr., and I then measure out



10 c.c. of the spirit for analysis. This I digest with sufficient potassium hydrate in a small strong glass flask, closed by a cork, through which passes a bent delivery tube, dipping under a column of mercury in a test tube, of such a height as will enable me to heat gently on a water-bath under pressure without bursting the flask. This point is ascertained by a blank experiment, during which the flask is wrapped in a cover to prevent accident; and once arrived at, the same flask and mercury column are always employed. After digestion under pressure with frequent agitation for some time (an hour being usually ample), water is added, and the contents of the flask evaporated in a basin until no smell of spirit is perceptible. The residual liquid having been rendered *just neutral* with sulphuric acid, is filtered into a flask containing 75 c.c. of permanganate solution, previously diluted to 200 c.c. with water and acidulated with 20 c.c. dilute sulphuric acid (1 in 3), and the flask having been corked is left for half an hour. At the end of that time excess of saturated solution of potassium iodide is added (which should produce a clear deep orange solution), and the whole brought under a burette containing the hyposulphite solution and titrated. The number of c.c. of "hypo." used is deducted from the number of c.c. of permanganate put in, and the difference multiplied by .00375 gives the amount of ethyl nitrite in the 10 c.c. taken for analysis, and if this be multiplied by 100 and divided by 10 times the specific gravity of the original spirit, the answer will be the percentage of ethyl nitrite by weight. In working with spirits of unknown strength it is advisable to put only 20 c.c. of permanganate into the flask at first, diluted and acidulated as directed, and then if all the colour disappears under five minutes, to add 5 c.c. more at a time, until a permanent colour is obtained, lasting five minutes, when the addition of another 5 c.c. will suffice before setting aside for the half hour. In a good spirit it is sufficient to take 5 c.c. for analysis, and to use 35 to 38 c.c. permanganate.

I am the more inclined to believe in the accuracy of this method, because I have found, by experiment, that the action of potassium nitrite on permanganate is not thoroughly trustworthy under half an hour. Ethyl nitrite is, however, much more rapidly affected, and I am at present engaged on a process whereby saponification is entirely avoided, and the whole thing does not occupy more than ten minutes. Until I publish this, I reserve my results on the actual constitution of the spirit, and the loss it undergoes by keeping. I am not at all clear that we should depend entirely on the ethyl nitrite alone for the real value of this medicine, and my other method depends on the estimation of the aldehyd and other bodies present in the article when properly made according to the official process.

The following are some analyses of pure spirits (specially made for me by Mr. Phillips—of Messrs. Knowles and Phillips—strictly by the B.P. process, and answering the gravity and separation tests of that authority), which were recently performed by one of my advanced students, Mr. Luther Scammell:—

Sample No. 1	contained	3.05	ethyl nitrite
" "	2	"	2.91 " "
" "	3	"	2.96 " "
" "	4	"	2.35 " "
" "	5	"	2.39 " "
" "	6	"	2.93 " "

I always prefer to do a blank experiment, using 20 c.c. pure rectified spirit, and the same weight of potassium hydrate as I use to the ether, and check it side by side with the sample experiment. In practice I use about two grammes K H O and add 10 c.c. of rectified spirit, which aids its solution and helps saponification of the ethyl nitrite. I have also often used, for the saponification, a small flask fitted to a well cooled upright condenser, and worked at the boiling point; but I find the simple arrangement above stated does just as well.

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## ANALYSES OF FLOURS AND BREADS.

BY J. CARTER BELL, F.C.S.

*Read before the Society of Public Analysts, on 4th June, 1879.*

SINCE December, 1877, I have been engaged upon the analyses of flour and bread, with the object of satisfying myself, by actual experiment, as to the quantity of phosphate of alumina contained in those two essential articles of food. Like many other chemists I was under the impression that the quantity of alum calculated from the phosphate of alumina found in a four-pound loaf was very small, but since I have analysed over one hundred samples, my views have been considerably modified. It is with diffidence I bring these analyses forward, as the Institute of Chemistry seems completely to ignore the original work of Public Analysts, and is groping hopelessly in the dark; whereas, if some guidance were accepted from men who have had practical experience, the Institute might gain some information upon the analysis of food, of which it confesses itself at the present time ignorant. In the Conference upon Milk no mention was made of the labours of Mr. Wanklyn, myself and others. In my experiments upon milk, I had 183 cows milked in my presence at various times and seasons; the milk from the majority of these cows was analysed separately, and all information, such as food, age, colour of cow, &c., was obtained, so that accurate data could be registered for fixing a milk standard, which I flatter myself I have obtained, and now decide according to that standard. It may be that this quiet ignoring of work accomplished, may arise from a modest desire of the Institute that men should not labour and the Institute enter into their labours.

In the following analyses, which for the above reasons I forward to the Society of Public Analysts, I have been careful to obtain samples of flour and bread of acknowledged purity. Many of the samples of flour were obtained from Mr. Render, of the Crown Flour Mills, Salford, and of Mr. Moss, of West Gore Street Mill, Salford; they, knowing what I required the samples for, were most careful in supplying them as pure as they could possibly be. My method of analysis was that proposed by Dr. Dupré, and modified by Mr. Wanklyn. Before incinerating flour or bread, I always thoroughly dry the samples, as I find they burn away in a much shorter period, and no unpleasant vapours are evolved.

Much has been said and written about the logwood test and its uncertainty, but according to my experience, if the solution is prepared according to the directions given by Mr. Horsley, it works admirably. I take 16 grammes of freshly-cut logwood, and

digest in cold methylated spirit for about eight hours, with an occasional shake of the solution ; at the end of the eight hours the clear liquor is poured off.

For bread, about 10 grammes of the crumb are taken, and a mixture consisting of 90 c.c. of water, 5 c.c. of the logwood solution, and 5 c.c. of a saturated solution of carbonate of ammonia is poured over the bread in a porcelain dish. If the bread contains alum, a dark lavender blue soon makes its appearance. The bread is washed and dried ; if the blue lavender colour remains, I always find that alum is present. For flour, I weigh out 10 grammes, mix with 10 c.c. of water, then add 1 c.c. of logwood solution, and 1 c.c. of carbonate of ammonia solution ; if the flour is pure, a pinkish colour is obtained ; whereas, if alum is present, the pink is changed to lavender, and I have detected alum in flour in so small a quantity as 3 grains to the four-pound loaf. By having a standard solution of alum and adding it to flour, it will be at once seen whether the logwood solution is fit to use. I have had mine made up for several months, and it is still good. Until I read Dr. Dupré's paper, I had not paid much attention to the silica in flour and bread ; but I now see that it forms a very important item in the analysis, because whenever I obtained a high silica, I looked for a high phosphate of alumina. In all cases of flour and bread ; I have calculated the silica and alum in grains to the four-pound loaf.

The first lot of five flours I obtained from Mr. Render, in 1877. The crown is the trade mark of the firm ; five crowns being the best flour, and made from the centre of the grain of the choicest wheats, while the lower crowns are of inferior quality. Thus, the price of five crowns is 48s. a sack, while one crown is 34s. ; the intermediate ones are between the two extremes. These flours were made from a mixture of English and Californian wheats. No. 2 crown has a very high phosphate of alumina, equalling about 16 grains of alum to the four-pound loaf. I thought that there must be some mistake as regards this flour, which led me to make further experiments. The flour was analysed four times, with the following results :—

					Grains of Silica to 4 lb. loaf.		Grains of Alum to 4 lb. loaf.		
No. 1	Silica	·100	..	Phosphate of alumina	·021	..	21	..	15½
2	„	·102	..	„	·017	..	21½	..	12¾
3	„	·105	..	„	·020	..	22	..	15
4	„	·109	..	„	·024	..	22¾	..	18

These results do not agree so well as could be wished, owing, I expect, to the mechanical mixture. I cannot believe that this amount of alumina is a constituent part of the grain, but must arise from imperfectly cleaned wheat. The large percentage of silica is an important item to be noticed in the analysis ; any chemist using moderate care could not return this flour as adulterated with alum. Five pounds of the flour were made into bread. The analysis of the bread crumb gave :—

Moisture	..	..	..	..	45·000	per cent.
Silica	..	..	..	..	·066	„
Phosphate of iron	..	..	..	..	·007	„
Phosphate of alumina	..	..	..	..	·011, or 11½	grains alum to the 4 lb. loaf.

It is my practice in bread analysis, to deduct 10 grains of alum from the total quantity calculated from the phosphate of alumina found in a four-pound loaf. So that on the above bread, when the ten grains are deducted, the quantity left would be

so small, that taking notice of the high silica, this bread could not be returned as containing alum. Out of the one hundred samples I have examined, this is the only instance of a loaf which contains 11 grains of alum.

Two other flours—one marked Russian, and the other Ghirka—gave high alumina, but at the same time high silica : these were coarse flours, such as a good baker would not like to use.

The analyses of these were as follows:—

	Russian.			100 parts contain			Ghirka.
Moisture .. .. .	13	86	.. .. .	8	280	.. .. .	8
Ash .. .. .	58	.. .. .	.. .. .	592	.. .. .	.. .. .	592
Silica .. .. .	055	.. .. .	.. .. .	062	.. .. .	.. .. .	062
Phosphate of iron .. .. .	007	.. .. .	.. .. .	007	.. .. .	.. .. .	007
Phosphate of alumina .. .. .	016	.. .. .	.. .. .	016	.. .. .	.. .. .	016

2½ lbs. of this Russian flour were made into bread ; it made a very coarse brown loaf, and the analysis was as follows:—

Moisture .. .. .	42	700
Silica .. .. .	034	.. .. .
Phosphate of iron .. .. .	006	.. .. .
Phosphate of alumina .. .. .	010	or 10 grains to 4 lb. loaf.

Here, again, the deduction of the 10 grains leaves nothing to return as alum. These I consider extreme cases : for it will be seen by the great number of samples of bread which I have bought from shops in Salford, not one reaches 10 grains of alum to the four-pound loaf.

Some of the flours in the following list require a little explanation. No. 1 Crown has a high silica ; this analysis was made in 1877, but while writing this paper I have estimated the silica again, and the mean of the two gives 077. No. 2 I have already explained. I have tried to obtain some more of the same kind of flour but have not succeeded. In June, 1877, I analysed another sample of 2 Crown Flour—

Silica .. .. .	009
Phosphate of iron .. .. .	003
Phosphate of alumina .. .. .	008

In March, 1879, another lot of 2 Crown gave—

Silica .. .. .	021
Phosphate of iron .. .. .	004
Phosphate of alumina .. .. .	010

From these, and other samples, I am inclined to believe that the sample of 1877 was an exceptionable one. I have found that fine flours are less likely to contain high silicas and aluminas when they have been prepared by what is called the “ high grind process :” by this a central portion called “ extract ” is taken from the wheat, by the millstones being kept further apart than by the old process of grinding ; thus leaving a large amount of flour adhering to the bran, which being again re-ground gives a poor flour called “ bran flour,” which is liable to contain more alumina than the extract flour, in consequence of being subject to a more severe treatment between the stones.

Between the “ extract ” and the bran flour there are several intermediate qualities of semolina flour, from which some of the choicest flours now in use are produced.

The American spring wheat has a high silica, '054; this was estimated in 1877. Within the last few days the analysis has been repeated, with the same results.

Residue Flour is called in the trade "inferior re-grounds."

*Bran Flour.* This is flour that lies closest to the skin, which has been removed by second grinding, and only produced by the high grind process.

*Exhaust Flour.* This is flour drawn from the stones by the draught which keeps the stones cool. It is liable to contain a larger quantity of alumina than found in ordinary flour.

No. 18.—From a country mill in Cheshire.

Nos. 19, 20, 21.—Made in Salford by Mr. Moss, by the old process of grinding.

Nos. 26, 27.—Bought from bakers, in Salford.

	100 parts contain					Grains	
	Moisture.	Ash.	Silica.	Phos- phate of Iron.	Phosphate of Alumina.	of Silica 4lb. loaf.	of Alum 4lb. loaf.
1. One Crown Flour .. .. .	13.02	.628	.077	.0107	.018	16½	13½
2. Two " " .. .. .	12.62	.604	.105	.0056	.0204	22	16
3. Three " " .. .. .	12.46	.52	.024	.003	.009	5	7
4. Four " " .. .. .	9.84	.448	.015	.005	.007	5	5½
5. Five " " .. .. .	12.08	.488	.012	.003	.005	2½	4
6. White English Wheat, 1877 .. .. .	11.82	.484	.010	.002	.004	2	3
7. Red " " .. .. .	13.62	.438	.020	.004	.010	4½	7¾
8. American Spring Wheat .. .. .	12.62	.492	.056	.006	.013	11¾	10
9. " Red Winter Wheat .. .. .	13.06	.380	.014	.002	.007	3	5½
10. Empress Hungarian .. .. .	11.44	.368	.010	.001	.002	2	1½
11. Residue Flour, from 1, 2, 3 mixture of Crown ..	9.48	.476	.028	.010	.010	5¾	7¾
12. Bran Flour .. .. .	8.92	.488	.029	.009	.012	6	9½
13. Exhaust Flour .. .. .	11.35	.610	.0268	.0058	.011	5½	8½
14. Russian Flour .. .. .	13.86	.580	.055	.0072	.0162	11½	12½
15. Egyptian " .. .. .	12.98	.700	.020	.0045	.0059	4½	4½
16. Ghirka " .. .. .	8.28	.592	.062	.0067	.0163	13	12½
17. Semolina " .. .. .	7.02	.440	.011	.0008	.0062	2½	4½
18. Flour, English and foreign wheat, } English, } ¾ foreign; the foreign principally Californian )	12.00	.400	.020	.001	.001	4½	¾
19. Straws, made in Salford .. .. .	13.22	.672	.010	.0021	.0023	2	1¾
20. Coarse Flour, or seconds, containing bran ..	13.92	1.44	.052	.0032	.0038	11	4½
21. White Flour, made in Salford .. .. .	13.02	.690	.023	.0032	.0018	5	1½
22. Peerless Flour, made by Banaman, Sherman and Co., Rochester, U.S. .. .. .	13.30	.500	.011	.00025	.001	2½	¾
23. Gilt Edge, made by Chase, Bristol and Bide, Rochester, U.S. .. .. .	13.04	.516	.020	.00027	.0008	4½	½
24. Californian Flour .. .. .	12.60	.480	.021	.0064	.0078	4½	6½
25. White English, 1878 .. .. .	14.90	.368	.021	.0035	.0049	4½	3½
26. .. .. .				.0005	.0015		1
27. .. .. .	12.80		.0335	.004	.009	7	7
28. Two Crown Flour, total produce of wheat—40 } per cent. Red English, 30 per cent. Califor- } nian White, 30 per cent. Canadian White .. }	12.80	.260	.023	.0037	.0037	4¾	6½
29. Bran Flour from Two Crown Mixture .. .. .	12.30	.76	.046	.007	.016	9½	12½
30. Two Crown Flour, less 5 per cent. Bran Flour ..	13.00	.26	.0214	.004	.0106	4½	8½
31. P. A. Campbell, San Francisco .. .. .	12.200	.300	.016	.003	.004	3½	3
32. J. F., Salem Mills, United States.. .. .	10.320	.448	.012	.004	.004	2½	3
33. Albany City Mills, United States.. .. .	10.000	.520	.013	.002	.001	2¾	¾

The following thirty-two breads were bought from bakers in Salford, and the crumb of the bread was taken for analysis—

Bread	Moisture.	Silica.	Phosphate of Iron.	Phosphate of Alumina.	Grains of Silica to 4lb. loaf.	Grains of Alum to 4lb. loaf.
1.	46.10	.014	.0010	.0030	3	3
2.	45.00	.033	.0013	.0067	7	6½
3.	45.50	.019	.0013	.0037	4	3½
4.	40.30	.010	.0013	.0022	2	2
5.	40.50	.012	.0010	.0030	2½	3
6.	46.00	.015	.0013	.0046	3	4½
7.	44.50	.017	.0016	.0034	3½	3½
8.	46.00	.014	.0018	.0082	3	8
9.	46.00	.013	.0010	.0040	3½	4
10.	45.50	.039	.0029	.0031	8½	3
11.	46.50	.014	.0013	.0052	3	5
12.	46.00	.018	.0010	.0050	3½	5
13.	46.00	.037	.0013	.0057	7½	5½
14.	46.00	.021	.0026	.0026	4½	2½
15.	46.20	.013	.0032	.0028	2½	2½
16.	47.50	.019	.0005	.0045	4	4½
17.	46.50	.012	.0013	.0043	2½	4½
18.	49.50	.016	.0018	.0032	3½	3
19.	47.50	.021	.0016	.0064	4½	6½
20.	46.50	.016	.0018	.0037	3½	3½
21.	47.20	.029	.0018	.0042	6	4
22.	46.50	.0205	.0018	.0068	4½	6½
23.	45.50	.024	.0018	.0064	5	6½
24.	46.00	.015	.0026	.0066	3	6½
25.	45.30	.015	.0040	.0052	3	5
26.	46.20	.019	.0032	.0044	4	4½
27.	44.50	.019	.0040	.0038	4	3½
28.	44.00	.020	.0026	.0058	4½	5½
29.	45.50	.012	.0016	.0044	2½	4½
30.	44.50	.019	.0018	.0048	4	4½
31.	44.00	.017	.0026	.0042	3½	4
32.	46.00	.025	.0018	.0058	5½	5½

The following eight breads were made under my own superintendence from flour which I had analysed, and which appear in the table :—

		100 parts contain			Grains of Silica to 4lb. loaf.	Grains of Alum to 4lb. loaf.	
Bread made from		Moisture.	Silica.	Phosphate of Iron.	Phosphate of Alumina.		
One Crown Flour	.. ..	45.00	.051	.001	.003	10½	3
" " Two	" .. ..	45.00	.065	.0067	.011	13½	11
" " Three	" .. ..	40.00	.019	.0026	.009	4	9
" " Four	" .. ..	38.00	.016	.005	.004	3½	4
" " Five	" .. ..	36.50	.013	.0045	.0022	2½	2
" " White English Wheat	.. ..	36.90	.015	.003	.004	3	4
" " Red	" .. ..	39.50	.020	.0021	.0053	4½	5½
" " Russian Flour	.. ..	42.70	.034	.010	.0053	7	5½

These breads were made by Mr. Render, from samples of flour ground by himself.

The bread in most cases was tried with logwood, but gave no indications of alum.

Bread	50 per cent. English Red,	50 per cent.	Moisture.	Silica.	Phosphate of Iron.	Phosphate of Alumina.	Grains of Silica to 4lb. loaf.	Grains of Alum to 4lb. loaf.
Canadian White	.. ..	.. ..	42.50	.019	.0032	.0082	4	8
Pure White Canadian	.. ..	.. ..	42.50	.021	.0018	.0035	4½	3½
Canadian Semolina	.. ..	.. ..	43.90	.008	.0026	.0032	1½	3½
50 per cent. English Red, 50 per cent. Semolina	.. ..	.. ..	43.00	.015	.0026	.009	3	9
Californian Flour	.. ..	.. ..	43.50	.023	.0072	.0100	4½	10
One Crown Flour	.. ..	.. ..	46.50	.019	.0035	.0031	4	3
Four	" .. ..	.. ..	45.00	.008	.0053	.0053	1½	5½

The following are some instances of pure samples of bread, which when treated with the logwood solution gave a very suspicious blue colour when wet, and caused me to think that alum was present, but after washing and drying the sample there was not the slightest trace of blue colour; and I should strongly urge all analysts to dry the

samples of bread before giving a decided judgment upon the presence or absence of alum. It is now my habit to enter in a note-book my opinion as regards a sample of bread when treated with the logwood solution before taking further steps, to show how easily one may be deceived by giving a verdict without trying the logwood test. I had two samples of bread from the County of Chester, a few days since. The logwood test was applied as usual. I entered—"The bread has a bluish colour, and I should think there will be about 8 grains of alum to the four-pound loaf."

The analyses of the samples were—

48.1	.008	.002	.006	1½	6
47.5	.012	.004	.004	2½	4

When the bread was dry there was no blue colour.

The following are some samples which I have analysed, thinking from the logwood test that they contained alum; if I had waited until the logwood bread was dry, I should then have seen that I had been mistaken, but having begun the analysis I thought it would be interesting to finish. I have arranged them in order of the silicas.

Silica.	Phosphate of Iron.	Phosphate of Alumina.	Grains of Silica to 4 lb. loaf.	Grains of Alum to 4 lb. loaf.
.008	.002	.005	2½	5
.012	.004	.004	3½	4
.018	.003	.005	5	5
.020	.004	.003	5½	3
.023	.005	.010	6	10
.027	.006	.010	7½	10
.031	.004	.009	8½	9
.031	.006	.010	8½	10
.031	.004	.009	8½	9
.039	.003	.008	11	8

Bread containing alum—

.008	.003	.026	2½	26
.015	.004	.025	4½	25
.016	.004	.034	4½	34
.017	.003	.037	4½	37
.020	.004	.040	5½	40
.020	.005	.024	5½	24
.022	.003	.026	6	26
.029	.003	.041	8½	41
.030	.005	.037	8½	37
.030	.005	.028	8½	28
.033	.004	.015	9½	15
.037	.004	.021	10½	21
.040	.005	.032	11½	32
.041	.004	.015	11½	15
.041	.008	.013	11½	13
.046	.003	.020	12½	20

I thought it would be interesting to trace the alumina from the wheat, through the various products. I therefore procured some wheat from Mr. Render, and he prepared the bran, flour, &c., specially for me.

Contained in 100 parts

	Moisture.	Ash.	Silica.	Phosphate of Iron.	Phosphate of Alumina.	Grains of Silica to 4 lb. loaf.	Grains of Alum to 4 lb. loaf.
English Wheat grown upon chalk soil *	9.512	1.720		.004	.013		10
Bran, 18½ per cent.	12.400	5.640	.206	.016	.016	43½	12½
Sharps, 8½ "	12.720	2.000	.034	.007	.017	7	12½
One Crown Flour, 26 per cent.	13.20	.500	.008	.003	.007	1½	5½
Four " 45 "	13.28	.368	.011	.002	.006	2½	4½

\* The sample of wheat had been lying in the miller's office for some days. This will account for the low moisture.

Mr. Penney, on page 80 of the *Chemical News* for this year, states—"It has recently become apparent that the attempt to fix upon a standard must be abandoned." My labours, which have extended over fifteen months, during which time I have examined nearly two hundred samples, lead me to a more hopeful conclusion, and appear to prove that a standard can be fixed; and a chemist with common judgment ought to be able to determine whether any excess of alumina is due to adulteration, or to other causes. It may please the public to know that out of many hundred samples I have only found one case of flour adulterated with alum.

Dr. Dupré said he found the logwood often gave a re-action, but the colour disappeared when drying; he was in the habit of drying in an air-bath, and that he believed was the original direction when this test was first brought prominently forward. Not unfrequently flours might give a suspicion, but dry them and it disappears at once. One point in Mr. Bell's paper struck him as being of value, viz., that the bran in flour should be estimated, and if possible the bran in the bread, because bran contains a large amount of silica and very little alumina. He had just had nine samples of bread to analyse. One gave the logwood reaction and contained alumina equivalent to 42 grains of alum per 4 lbs.—the silica came to 17 grains per 4 lbs.—so that he reported it to be adulterated with about 24 grains of alum.

Dr. Muter said that, with reference to the elucidation of the silicate question by ascertaining the amount of bran present in the flour, he should propose an attempt at the estimation of the cellulose, by a rapid process such as he had tried some years ago on a drug containing only a minute quantity, and which consisted in finding the amount soluble in ammoniacal cupric oxide solution. He prepared some of the re-agent of which he took two equal parts by weight, and placed them side by side; into one he put the impure cellulose to be estimated, and, after proper maceration, he filtered both fluids through equal weights of a mineral filtering medium, and then evaporated both and dried at the same temperature, and for the same time. The increase in the one residue over the other was supposed to be cellulose; and his impression was that the process promised well, but he intended to try it again on this flour question at his first spare time. Mr. Bell had noticed a fact about the logwood test which was quite correct; namely, that a colour sometimes appears while wet, but disappears on drying. In such cases he had noticed that there was usually sufficient alumina to calculate to about 12 grains alum per loaf, and an excess of silica such as to prevent its being considered to be really alum. He remembered that in the cellulose process he spoke of, much depended upon the temperature at which the maceration was done, but the exact particulars he had now forgotten.

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#### ON DR. KOETTSTORFER'S METHOD FOR THE EXAMINATION OF BUTTER FOR FOREIGN FATS.

By G. W. WIGNER, F.C.S.

SINCE the publication of this process in the *ANALYST* last month, I have carefully tested it on various samples of genuine butter and of adulterated butters, and other fats, such as dripping or lard, and find it not only a quick and handy process, but a reliable one.

The point of neutrality is very sharply indicated by the phenol-plitaleïn, and by



working on moderate quantities, say 50 grains, or thereabouts, of the filtered fat it is possible to obtain a much greater relative degree of accuracy than by the determination of the fatty acids.

I find it advisable, after saponification, to dissolve the soap in hot water and titrate while still hot; by this means the precipitation of the fatty acids during the process of titration is prevented, and the finish of the neutralization seen more distinctly.

I find that my samples of butter require a slightly larger percentage of potash to saturate them than the samples investigated by the author of the process, but the difference is small, and there is about 3·0 per cent. difference between the potash required by any fat I have yet tested, and that required by a genuine sample of butter.

#### SALE OF FOOD AND DRUGS ACT AMENDMENT BILL.

THIS Bill, a copy of which appeared in our last number, has passed the House of Commons, and is now before the House of Lords. The Commons have amended the last clause by limiting the provision for serving a summons within 28 days from the time of the purchase of an adulterated article, to "the case of a perishable article" only, and the following new clauses have been introduced:—

"Any medical officer of health, inspector of nuisances, or inspector of weights and measures, or any inspector of a market, or any police constable under the direction and at the cost of the local authority appointing such officer, inspector, or constable, or charged with the execution of this Act, may procure at the place of delivery any sample of any milk in course of delivery to the purchaser or consignee in pursuance of any contract for the sale to such purchaser or consignee of such milk; and such officer, inspector, or constable, if he suspect the same to have been sold contrary to any of the provisions of the principal Act, shall submit the same to be analysed, and the same shall be analysed, and proceedings shall be taken, and penalties on conviction be enforced in like manner in all respects as if such officer, inspector, or constable had purchased the same from the seller or consignor under section thirteen of the principal Act.

"The seller or consignor or any person or persons entrusted by him for the time being with the charge of such milk, if he shall refuse to allow such officer, inspector, or constable to take the quantity which such officer, inspector, or constable shall require for the purpose of analysis, shall be liable to a penalty not exceeding ten pounds."

ANALYSES AT A DISCOUNT.—At the Breconshire Quarter Sessions, a letter was read from the Local Government Board, referring to the county having made no arrangements for obtaining samples for analysis by the Public Analyst under the Sale of Food Act, and requesting that the provisions of the section of the Act bearing upon the point might be brought before the Court. Sir Joseph Bailey asked what expense it was to the county, and what good it was. Mr. Lloyd said the analyst was paid by the year, and not by the case. Sir Joseph observed that they were perfectly content with their food and drugs. The report of the County Analyst was read as follows:—"I have the honour to report that I have not received during the past quarter any sample of food, drink, or drugs." The Chief Constable was requested to take a number of cases, and ascertain what was the amount of remuneration.

DECLINING TO APPOINT AN ANALYST.—At a recent meeting of the Leominster Town Council a letter was read from the Local Government Board, calling attention to the fact that they had already sent two communications, asking if the Council had further considered the subject of the appointment of an analyst for the Borough, and if so, the Board wished to be informed of the result. It was stated that the Local Government Board had been pressing this matter on the Council for nearly two years. Mr. Sale said he presumed the Council would send back the stereotyped reply—that they had not appointed an analyst yet. This was agreed to by the Council, and Dr. Pentland remarked that if it should be necessary to have an analysis made under the provisions of the Sale of Food Act, such analysis would be easily procurable from the Public Analyst of Worcestershire or other adjoining counties.

## REVIEWS

*A Manual of Organic Chemistry, Practical and Theoretical, for Colleges and Schools.*

By HUGH CLEMENTS. London: Blackie & Son, 1879.

THIS work, despite its somewhat ambitious title, is a small volume of some 280 pages. A large portion of it is stated to be a reprint from serial papers which have appeared in the *English Mechanic* and *World of Science*, and it is put forward with the object of forming a "text book" for candidates preparing for examination.

There is one chapter on the "Identification of Organic Substances," which, in its general design and style, is original, and likely to prove useful to a student. This chapter extends to some 46 pages, and the author has evidently taken some pains to make it worthy of reference; and, notwithstanding some curious and unfortunate errors which occur, he has, on the whole, succeeded. A more systematic arrangement would, however, have improved it.

The chapter on "Oils" would be useful for reference, if the errors, which are scattered through it, were weeded from it. Thus, we are told that linseed contains 20 per cent. of fat, and a few pages further the maximum limit is fixed at 27 per cent.

But, having noticed these two chapters, we cannot give a single word of praise to the remainder of the book. Its evident object is to serve as a "crib," and enable a student to successfully pass an examination without having really acquired the knowledge which the examination was meant to test.

Nearly 90 pages are occupied with what professes to be a reprint of the papers set in Organic Chemistry at the Science and Art May Examinations for the last eleven years, with the correct answers or references to that part of the volume in which they may be found. It is obvious that the use of such a "key" as this must be attended with both chemical and moral injury to the student, and must compel the examiners to take far greater heed of the results of practical work than of the replies to questions which may be learned by rote.

Another chapter consists of a series of so-called exercises, which are simply a series of questions, some being of the most puerile kind, such as "What organic substances taste acid?" "sweet?" "bitter?" "peculiar?" while in others the student is requested to make a qualitative analysis of the following "mixtures," among which appear beef, mutton, blood, oranges, urine, coal gas, ink, &c.

We fear that Mr. Clements' loose mode of expression is not calculated to foster habits of accuracy in those who take his book as a guide.

*An Introduction to Pharmaceutical and Medical Chemistry (Theoretical and Descriptive).*

By DR. JOHN MUTER, F.C.S.

*An Introduction to Analytical Chemistry (for Pharmaceutical and Medical Students).* By the same author. London: Simpkin & Marshall, and Baillière, Tindall & Cox.

These two volumes constitute the second edition of the author's *Pharmaceutical Chemistry*, which has been thus divided, owing to its bulky proportions, into a book for the laboratory and one for home study. The organic portion has been somewhat

extended, but otherwise the whole work retains its original scheme of teaching the salts under their respective acidulous radicals instead of following the usual metallic arrangement. The practical volume contains *inter alia* a new course for the third group in the presence of phosphoric acid. Criticism at our hands is manifestly impossible.

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*Skeleton Notes on Analytical Chemistry.* By A. J. BERNAYS. London: Churchill, 1879.

THESE skeleton notes are extracted from the fifth edition of Dr. Bernay's *Notes for Students in Chemistry*. They form a small and handy volume of about 50 pages. The author has not adopted the tabular form, but presents all the information in ordinary letterpress. The arrangement of the book is good, and by the careful use of four different types reference is very greatly facilitated. It is specially designed for the use of medical students, but those who are carrying the study of chemistry far beyond the simple requirements of the College of Surgeons, will find it not only a useful pocket companion but reliable for its accuracy.

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*Nitric Nitrogen in Guano.*

MR. R. R. TATLOCK has communicated a paper on the above subject to the Newcastle Chemical Society. He points out that by the soda lime process a large portion of the nitrogen, which exists in guanos in the form of nitrates, is transformed into ammonia during the combustion, and a considerable error therefore introduced into the analysis. As many natural guanos contain 1 to 2 per cent. of nitrates the error is important even in reference to them, but becomes much more so when guano has been adulterated with nitrate of soda; since, if a separate determination of the nitrates is made, and no allowance made for the quantity obtained as ammonia, a purchaser would virtually be called upon to pay for the nitric nitrogen twice over.

The author has made a number of experimental soda lime combustions, in which small known quantities of nitrate of potash were intimately mixed with known organic substances such as starch, albumen, sugar, &c., and then burnt. From these experiments he draws the following conclusions:—

1. That using 3 of organic matter (starch) to 1 of nitrate, 45·80 per cent. of the nitric nitrogen can be obtained.
2. That in no case was the whole of the nitric nitrogen converted into ammonia, the greatest proportion being 97·40 per cent.
3. That the results are somewhat variable, even with the same proportion of the ingredients, something always depending on the completeness with which the mixture is made.

The author reviews the different methods used for determining Nitric Nitrogen in Guanos, and expresses a strong opinion in favour of Crums' process, since the results are not affected by the organic matter. He points out, however, the desirability of testing the liberated gas by a warm solution of iron sulphate to prove that it is entirely nitric oxide.

## CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

TO THE EDITOR OF "THE ANALYST."

SIR,—The following is the result of an analysis of a cream supposed to have been tampered with, as it did not churn properly :—

Fat .. .. .	37.76 (with free lactic acid).
Solids, not fat .. .. .	11.41 of which 1.183 is common salt.

—49-17

I was unable to find any foreign substance whatever, either organic or inorganic, with the exception of the salt. The cream had commenced to turn sour, but had no rancid smell.

I have heard before of cream refusing to churn without an enormous amount of labour, when there has been no suspicion of foul play. Is there any explanation of this phenomenon?

I am, &c.,

A. PERCY SMITH.

RUGBY.

TO THE EDITOR OF "THE ANALYST."

SIR,—Our object in writing to you in the first instance was to prevent misunderstanding, which might arise from this statement in Dr. Dupré's paper, viz. : that after our successful appeal at Salford, a second conviction had taken place before a magistrate (referring to a case at Lambeth), against which no appeal had been made. So we wrote to say that the conviction did not refer to the "Steamer over a Globe" Violet Powder, and that since then the same magistrate had practically reversed his former adverse decision, by a subsequent one in the case of a similar charge, made against our "Steamer over a Globe" Violet Powder, which he dismissed.

We decline to enter into any controversy concerning the fallacies and erroneous conclusions contained in Dr. Dupré's paper, as the bulk of it is a mere repetition of the charges made at the Salford Quarter Sessions Appeal; which a full bench of magistrates, presided over by a distinguished Queen's Counsel, declined to believe, after hearing the evidence of our witnesses, headed by the most eminent Public Analyst in the kingdom, supported by other Public Analysts, and also by Physicians and Surgeons of much distinction.

Though Dr. Dupré very condescendingly professes himself not averse to learn from us, it is no part of our business to teach him that which he should already know, viz., the reasons why the authorities at Hyde, Salford, Ashburton, Tiverton, Oakmere, Frodsham, and Lambeth have one and all refused to credit these fancy charges against the use of selenite in violet powder. It is quite sufficient for us, that all these impartial and highly educated gentlemen of position, after hearing every adverse statement carefully set forth by our opponents, should invariably have considered the weight of evidence upon our side and dismissed all the cases.

Yours, &c.,

THE MANUFACTURERS OF THE "STEAMER OVER A GLOBE" VIOLET POWDER.

[We print this letter strictly on the principle of *audi alteram partem*, but as it gives no real experimental answer to Dr. Dupré's conclusions, the discussion must now close so far as we are concerned.—EDS. ANALYST.]

## ANALYSTS' REPORTS.

Mr. C. Estcourt, Public Analyst for Manchester, in his quarterly report presented to the Council, stated that during the quarter ending March 31st there had been analysed twelve samples of milk, nine of bread, seven of claret, six of port wine, two of tea, and one of sugar. The total number of samples analysed was thirty-seven, and one only was found to be adulterated, viz., a sample of bread, which was found to contain seventeen grains of alum to the 4-lb. loaf. The analyst added that it was very gratifying to observe that a great improvement had taken place in the quality of the milk supply. The report was adopted.

Mr. W. W. Stoddart, Public Analyst for Bristol, in his quarterly report to the Town Council, stated

that during the past quarter he had received eighty-three samples—fifty-nine from the inspector, and twenty-four from the public. Six samples of butter were good, and six samples each of flour and lard were genuine. Of the wine samples submitted for analysis all were unadulterated.

Mr. A. J. Edger, Analyst for the County of Durham, during the quarter ending March, examined 144 samples of food, drink, and drugs, and found 60 adulterated. The latter included 15 samples of milk, 20 of sweet spirits of nitre, 2 of tincture of rhubarb, 13 of cream of tartar, 3 of mustard, and 7 of whisky.

### LAW REPORTS.

**ADULTERATED CREAM OF TARTAR.**—Six tradesmen of West Hartlepool were recently brought before a full bench of magistrates for selling adulterated cream of tartar. The superintendent of police had obtained a certificate from the County Analyst in each case, and these certificates gave the following results :—William McCabe, Lynn Street—tartrate of lime, 8.29; sulphate of baryta, 0.50; sand, 1.20; total, 9.99. John Livingston, Church Street—tartrate of lime, 8.4. Wm. S. Rutter, Lynn Street—tartrate of lime, 7.75. Francis Smith, Durham Street—tartrate of lime, 6.61; sand, 0.25. Robert Embleton, Stockton Street—tartrate of lime, 6.81. Thomas Layburn, Belle Vue—tartrate of lime, 7.75. McCabe's case was taken as a test case; and in his certificate the Analyst observed that "commercial cream of tartar generally contains a small quantity of tartrate of lime;" and in McCabe's sample it was "present in excess." Mr. Simpson, who appeared as the advocate of all the parties, submitted that the circumstances did not call for a conviction. The article was of the kind demanded by the purchaser, and it was impossible to keep it free from tartrate of lime. The Chairman, after some deliberation, said the article might be considered commercially pure; and as these were the first cases of the kind before them the bench were not disposed to convict. They, however, recommended tradesmen, for their own protection, to take a guarantee from the wholesale merchant. Nor must the present decision be cited some weeks hence as a precedent. The whole of the cases were accordingly dismissed.

**ADULTERATED LUNCH BUNS.**—At the Salford Police-court, James Bradshaw, confectioner, 412, Regent Road, appeared in answer to the summons charging him with having sold buns which were not of the nature, substance, and quality demanded. Mr. Walker, assistant to the Town Clerk, prosecuted. Mr. Thompstone, the inspector under the Act, said that on the 18th April he visited the defendant's shop in Regent Road, and asked for seven lunch buns. He explained that he purchased them for the purpose of their being analysed, and divided each bun into three parts. The analyst received the samples from witness the same day, and being informed that they were adulterated, witness called at the defendant's shop on the 30th April, and told him that the buns had been found impure. The defendant said that the buns were supplied by Mr. Casson, of Swan Street, Manchester. Mr. J. Carter Bell, the Public Analyst for the Borough, said he received the samples of buns in question from the last witness. He analysed them, and found them to contain alum to the amount of fifty grains in the 4lb. loaf. It was a very large quantity, and that was the amount he declared it to contain after making full reductions. The weight of each bun was about two ounces. Witness considered the buns very indigestible. The defendant now said that he purchased the goods from Mr. Casson, and brought them to his shop; that was all he knew about them. Mr. Makinson: Could you detect alum in by the taste of the buns? Mr. Bell: No, the alum undergoes a change when mixed with the dough. Mr. Makinson, addressing the defendant, said the Act, as no doubt the defendant was aware, made the seller of the adulterated article liable himself; but he thought the character of the evidence was very different when the selling was by the person who made the bread. It was, however, the duty of the seller to see that he got articles of a good quality, and he could not be altogether excused. The defendant was fined 10s. and costs. The defendant remarked that Mr. Casson was considered a first-class tradesman, and it was with a desire to provide a first-class article that he had obtained the buns there.

**ADULTERATED MILK.**—Henry Blowers, local agent of the Cleveland Dairy, was charged on remand with selling adulterated milk. Mr. Fenwick, defended. Mr. F. W. Holt, sanitary inspector for the borough, had bought a pint of milk from defendant, and the County Analyst certified that the milk contained 5½ per cent of added water. Mr. A. J. M. Edger, the County Analyst, now attended court, and gave evidence as to the correctness of his certificate. There was usually 86 or 87 per cent. of water naturally in milk. The Society of Public Analysts had determined that pure milk should not have less than 9 per cent of solids not fat, there never having been known to have been less than that quantity in average milk. In the milk in question, only 8.73 per cent of solids not fat was found, which could not have been reduced except by the addition of water. There might possibly be 10 per cent. of added water

in the sample produced, as his standard was low. Milk varied very little throughout the year. Mr. Fenwick declined to cross-examine the witness. A letter was put in by Mr. Pattinson, analyst, which stated that, according to the standard, there was an addition of 7 per cent. of water, but that he had examined pure milk, and found it poorer. The Bench declined to admit it, as Mr. Pattinson was not present to support it. The Bench ordered defendant to be fined 5s. and costs.

**ADULTERATED BUTTER.**—At the Derby Police Court, Mr. T. H. Bennett was charged with selling, to the prejudice of the purchaser, a pound of butter not of the nature, substance, and quality demanded. Mr. A. Clarke prosecuted. He said on March 16th he went to the defendant's branch shop, Stanley Terrace, Peartree Road, and asked for a pound of 1s. butter, with which he was served by the defendant's assistant. When he told the assistant who he was, and why he had purchased it, the latter said, "It is not butter, it is butterine." He did not say so till he had been told who witness was. Witness divided the butter into three parts, and sent one to the Public Analyst, gave another to the assistant, and kept the other himself. On April 26th, he received a certificate from the Public Analyst, who said that the sample consisted of two-thirds foreign fat incorporated with one-third of butter, with water 14.5 per cent., and resembled the substance known as butterine. Though animal and vegetable fats, other than butter fat, have a certain nutritive value, they have not the nature and quality of butter as an article of diet. Defendant said that the article was sold as butterine, and not as butter. The Bench imposed a fine of 20s. and costs, in all £2 8s. 6d.

**ALUM IN BREAD.**—At the Salford Borough Police-court, John Baxter, baker, was summoned for selling adulterated bread. Mr. Walker, assistant to the Town Clerk, prosecuted. Mr. Thompstone, inspector, stated that on the 6th May he visited the defendant's shop and saw the defendant's wife, whom he asked for a 4-lb. loaf. The bread was supplied to him, and he divided it into three parts in the usual way, at the same time telling her that he had bought the loaf for the purpose of being analysed. On the 9th inst. he again visited the shop, and purchased a sample of the flour from which the defendant said the bread had been made. He also submitted a sample of this to the analyst. Mr. J. C. Bell, Public Analyst for the Borough, said that on the 6th inst. he received a sample of bread from the last witness, which had been purchased at the defendant's shop. He analysed it, and found it to contain 40 grains of alum to the 4-lb. loaf. The flour he found to be pure. The Magistrate, Mr. Makinson, was quite satisfied that this was a very serious case of adulteration, and he was also satisfied that the adulteration had been introduced by the defendant himself. It was a very bad case. The defendant said he hoped the magistrate would be lenient, as he was a very poor man and had an aged mother to support, being also himself in delicate health. Mr. Makinson said that might perhaps induce him to be a little more lenient than he otherwise should have been; but it was a very bad case, and he should fine him £4 and costs.

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### NOTES OF THE MONTH.

HERE is a lovely little piece of trade journalism. Replying to J.S.B., the *Grocer* says:—"We do not recollect reporting any blunder by the analyst you refer to. The analysts are guilty of so many blunders that it is quite impossible to remember any particular case." Setting aside cases of disputed nomenclature, and what really does or does not *legally* constitute an adulteration, we hold, on the contrary, that the really chemical blunders of Public Analysts in their laboratories can be proved to be so few as to be capable of being counted on the fingers of one hand. Considering the thousands of samples which have passed through their laboratories, and the risk of accidents always inherent to chemical analysis, there are very few bodies of men who can so proudly boast of accuracy as the Public Analysts. If their opinions, founded on their analyses, have, in perhaps twenty cases altogether, been reversed in court, it is nothing more than occurs to the most learned of our judges every day. Why does not the *Grocer* abuse the Vice-Chancellors every time their decisions are reversed on appeal? Simply because it is not their unpleasant duty to be the machines by means of which the law interferes with would-be fraudulent traders. *Hinc ille lachrymæ!*

The same print falls foul of us in a long leader, for publishing an account of the analysis of a sample of milk which was divided before being sent to Somerset House, and holds up our Publication Committee by name, as persons supporting such a course of procedure, calculated, it says, to injure the tradesman. This is another specimen of the eagerness with which the trade journals seize upon any pretext to vilify us. Is the editor of the *Grocer* to hold himself responsible for the good taste, and to consider his opinions identified with every piece of communicated news he publishes in his paper? If this be so, and he will accept such identification, we shall have much pleasure in showing him up from the news contents of his own paper, in a much worse light than he can possibly do us. Our Committee of Publication are responsible for the publication of the Transactions of the Society of Public Analysts; but for any communicated reports, correspondence, or notes, they do not assume any responsibility. If the editor of any journal or its managers are to be considered to always agree personally with every item of news they publish, then there would be an end of journalism altogether.

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Setting aside all this, however, the case put in the light in which it appears in the *Grocer*, is a gross perversion of the fact. An inspector retains his sample for the protection of the analyst's reputation, and the tradesman retains his for his own protection. We have made inquiries into the particular case, and find that the court ordered the *tradesman's* sample to be sent to Somerset House, and this was done: the inspector's sample being merely sent as a check against the fraudulent tampering with the tradesman's sample, which has too often been proved to have occurred. Knowing this well, as the *Grocer* must do, unless on such points its memory is conveniently vacuous, what was wrong in also sending a portion of the inspector's sample carefully divided in presence of witnesses, and retaining some as an additional check on the possible fraud on the analyst's reputation? But no! such a vile creature is an analyst, that the *Grocer* would deny him the slightest right to protection in any form, and in fact, the sooner the reputation of every chemist in England was blasted the better, for there would then be an end to the Act, and the old style of long profits on adulterated articles would return again, and in this Millennium, perhaps, even the *Grocer* would cease from troubling and be at rest.

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Mr. J. H. Collins has been appointed Public Analyst for the Borough of Helston.

Dr. W. Procter has been appointed Public Analyst for the City of York.

Dr. C. Meymott Tidy has been appointed Public Analyst for the Borough of Hertford.

Dr. W. Morgan has been appointed Public Analyst for the Borough of Tenby.

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#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Boston Journal of Chemistry; The Dairyman; The American Dairyman; The Practitioner; American New Remedies; Proceedings of the American Chemical Society; Le Praticien; The Inventors' Record; Gas Analyst's Manual, by F. W. Hartley; Commercial Organic Analysis, by A. H. Allen.

## RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price.
8134	C. H. Siemens .. ..	Apparatus for Dynamical Production and Application of Electricity .. ..	1/2
3694	R. W. Wallace .. ..	Manufacture of Sulphate of Ammonia .. ..	6d.
3976	M. R. Ward .. ..	Magneto-Electric Machines .. ..	6d.
3988	St. G. L. Fox .. ..	Electric Lighting, &c. .. ..	6d.
4006	P. Jensen .. ..	Electric Lighting Apparatus .. ..	6d.
4100	F. H. Varley .. ..	Producing Electricity and Electric Light .. ..	6d.
4074	A. Arnaud .. ..	Indefinitely dividing Electric Currents .. ..	2d.
4114	E. J. Welch .. ..	Dividing and Distributing Electric Currents for Lighting .. ..	2d.
4635	Ditto .. ..	Electric Lighting .. ..	2d.
4689	Ditto .. ..	Apparatus for producing Electric Light .. ..	2d.
4131	C. Norrington .. ..	Apparatus employed in the Manufacture of Sulphuric Acid .. ..	6d.
4148	J. C. Stevenson .. ..	Apparatus for the Manufacture of Alkali .. ..	6d.
4188	E. W. Parnell .. ..	Manufacture of Alkalies .. ..	4d.
4192	P. E. Lockwood .. ..	Medicinal Compounds of Extracts of Malt .. ..	4d.
4206	R. P. Higgs .. ..	Magneto, or Dynamo Magneto-Electric Machines .. ..	2d.
4208	C. W. Siemens .. ..	Means and Apparatus for Electric Illumination .. ..	8d.
4212	C. T. Bright .. ..	Lighting by Electricity .. ..	2d.
4223	J. Johnson and M. Milton .. ..	Manufacture of Gas .. ..	2d.
4226	T. A. Edison .. ..	Developing Electric Currents and Lighting by Electricity .. ..	1/-
4283	J. E. Stokes .. ..	Electric Lighting .. ..	6d.
4313	A. A. Cochrane .. ..	Obtaining and applying Electricity .. ..	2d.
4315	B. P. Stockman .. ..	Apparatus for producing Light and Electricity .. ..	2d.
4316	J. W. T. Cadett .. ..	Electrical Arrangements .. ..	6d.
4317	F. D. Tilleard .. ..	Lamps for Lighting by Electricity .. ..	2d.
4338	C. W. Harrison .. ..	Obtaining Light by Electricity .. ..	2d.
4344	F. J. Odling .. ..	Gas Batteries for the production of Electricity .. ..	2d.
4347	J. S. Wilson .. ..	Apparatus for producing Electric Light .. ..	6d.
4353	J. Imray .. ..	Treating Ammoniacal Liquor for the separation of Ammonia Compounds therefrom .. ..	4d.
4376	A. Scott and A. McDonald .. ..	Treating Residual Liquids in Sugar Manufacture .. ..	2d.
4388	S. F. Van Choate .. ..	Producing Electric Light, &c. .. ..	4d.
4452	S. G. Thomas .. ..	Manufacture of Phosphates and Manures .. ..	4d.
4558	Ditto .. ..	Ditto ditto .. ..	4d.
4456	F. H. Higgins .. ..	Apparatus for producing and subdividing Electric Light .. ..	6d.
4462	H. L. Thomas .. ..	Production of Electric Light .. ..	2d.
4466	C. Stewart .. ..	Distributing Electricity for the production of Electric Lights .. ..	6d.
4473	F. Gye .. ..	Apparatus for obtaining Electric Light .. ..	2d.
4502	E. G. Brewer .. ..	Lighting by Electricity .. ..	6d.
4517	J. Hardman and G. Wischin .. ..	Production of Anthracene .. ..	2d.
4526	J. Young .. ..	Manufacture of Ammonia .. ..	6d.
4549	J. Holloway .. ..	Treatment of Sulphides, &c. .. ..	4d.
4553	M. Gray .. ..	Manufacturing Carbons for Electrical Purposes .. ..	4d.
4559	C. Davis .. ..	Mechanism for producing Light and Heat by Electricity .. ..	2d.
4568	J. Mackenzie .. ..	Electric Light Apparatus .. ..	2d.
4573	G. Zanni .. ..	Apparatus for production of Light by Electricity .. ..	6d.
4575	H. W. Tyler .. ..	Electric Lighting .. ..	2d.
4611	E. Edwards and A. Normandy .. ..	Producing Light, &c., by Electricity .. ..	4d.
4646	J. S. Sellon and W. Ladd .. ..	Electric Lamps .. ..	6d.
4650	T. Clarke and E. Smith .. ..	Manufacture of Sulphuric Acid .. ..	8d.
4664	F. Ransome .. ..	Manufacture of Cement and Artificial Stone .. ..	4d.
4684	F. Wirth .. ..	Recovering Potassium of the Tartar as Hydrate of Potassa in Manufacture of Tartaric Acid .. ..	4d.
4690	J. H. Johnson .. ..	Electric Regulators, Lamps or Candles .. ..	2d.
4831	E. Packard, Junr., .. ..	Treating Bones for Manufacture of Manure .. ..	4d.
1879.			
144	W. Morgan Brown .. ..	Electric Lighting, &c. .. ..	6d.



# THE ANALYST.

AUGUST, 1879.

## THE COMPOSITION OF DEVONSHIRE CREAM.

By A. WYNTER BLYTH, M.R.C.S., &c.

*Read before the Society of Public Analysts, on 4th June, 1879.*

I HAVE recently been studying the composition of the substance known as Devonshire cream, and find the average composition as follows:—

	per cent.
Water .. .. .	28·675
Caseine .. .. .	3·530
Albumin .. .. .	·521
Galactine .. .. .	·050
Lactochrome .. .. .	Undetermined
Milk Sugar .. .. .	1·723
Milk Fat .. .. .	65·011
Ash .. .. .	·490
Chlorine in Ash .. .. .	·013
Calcic Phosphate .. .. .	·373

It will thus be seen that the milk has thrown up caseine with the fat, for if we allow that ordinary milk contains 86·87 of water and 3·98 per cent. of caseine, then the amount of caseine in the cream, if none were separated, would be—

$$\begin{array}{cccc} \text{Water.} & \text{Caseine.} & \text{Water.} & \text{Caseine.} \\ 86\cdot87 & : & 3\cdot98 & : & 28\cdot675 & = & 1\cdot31 \end{array}$$

But the cream instead of containing 1·31 per cent. actually contains 2·22 in excess of this quantity.

The amount of albumin follows strictly the caseine, for if we allow, as I have elsewhere affirmed, that the average percentage of albumin in milk is ·77 per cent., and therefore the ratio of caseine to albumin as 3·98 is to ·77, then the theoretical yield of albumin in this particular case would be ·66, the amount actually found being about ·1 per cent. lower than this estimate.

If the composition of the Devon cream shows clearly that there is some considerable separation of the caseine, the milk sugar follows very closely the proportions one would expect to find from the amount of water for taking the average of 4·0 of milk sugar dissolved in 86·87 of water, then in the present case—

$$\begin{array}{cccc} \text{Water.} & \text{Sugar.} & \text{Water.} & \text{Sugar.} \\ 86\cdot87 & : & 4\cdot0 & : & 28\cdot7 & = & 1\cdot3 \end{array}$$

Which does not deviate very considerably from the numbers actually obtained, viz., 1·723.

Pursuing the ratios still farther it will be noticed that the galactine also follows the same law, for if the number I have elsewhere given as the average percentage of this body in milk, viz., ·17, be taken, then

$$\begin{array}{cccc} \text{Water.} & \text{Galactine.} & \text{Water.} & \text{Galactine.} \\ 86\cdot87 & : & \cdot17 & : & 28\cdot67 & = & \cdot056 \end{array}$$

And .050 is the number experiment has yielded. Similarly the percentage of ash, which always depends upon two factors—one, the caseine; and two, the amount of water—may be similarly proved to agree closely with that which theory demands.

The analysis of Devon or any other cream presents but little difficulty: a weighed portion is taken, the fat melted, and after about half an hour's exposure to the heat of a water-bath, most of the caseine, &c., settles to the bottom, and the fat can be poured off as easily as that from butter. The residue remaining is now treated with petroleum and thoroughly exhausted. "The fat" and "solids not fat" are dried separately, which indeed is the only way in which the water can with any convenience be estimated.

With regard to the estimation of the other constituents, I have nothing new to add.

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### ON THE ANALYSIS OF BUTTER FAT.

By FRANK P. PERKINS, *Public Analyst for Exeter.*

HITHERTO the determination of the volatile as well as the non-volatile acids, contained in butter, has generally been accomplished in the gravimetric way. Satisfactory, however, as the processes which have been devised in this direction may be, there is little doubt that they are somewhat tedious to perform; and although where the greatest accuracy is required, analysis by weight must always rank the highest, yet a fairly accurate volumetric method, easily and rapidly executed, must be a desideratum. A few steps towards this end have already been made. In the first volume of THE ANALYST there is a paper by Dr. Dupré devoted principally to the volumetric estimation of the *volatile acids* in butter, and in a paper lately published in the same journal by Dr. Koettstorfer, the author proposes to determine the *non-volatile acids* volumetrically. About a year ago, I showed how the amount of volatile acids may be approximately ascertained by taking the acid filtrate derived from the insoluble acids, titrating a portion of it with K Ho to determine total acidity, evaporating another known portion to small bulk, titrating again, and then converting the difference between the two experiments to butyric acid. I have now made a further advance. On referring to Messrs. Angell and Hehner's treatise on "Butter," it will be found that the endeavour to obtain the amount of volatile acids by saponifying the fat and then distilling with sulphuric acid, was futile, the distillation was difficult to manage, and the results unsatisfactory; but I find that, by liberating the fatty acids with oxalic acid this difficulty is overcome, and I believe that the method now proposed will be found simple, workable, and fairly accurate. It is as follows. Weigh out 1 to 2 grammes of purified butter fat, saponify in a beaker in the usual way, drive off the alcohol, cool, set free the acids by adding a cold saturated solution of oxalic acid in very slight excess, pass through a small filter, previously moistened with water, wash the insoluble acids thoroughly, first by decantation with cold, and lastly with hot water on the filter, make up the filtrate to, say, 200 c.c., transfer 100 c.c. to a small retort connected with a condenser and distil slowly until the *whole* has passed over, add a few drops of litmus solution, titrate with deci-normal K Ho, calculate the amount consumed by the volatile

acids in 100 grammes of fat, and translate to butyric acid  $\left\{ \begin{array}{l} \text{C}_3\text{H}_7 \\ \text{C O Ho.} \end{array} \right.$  The insoluble acids on the filter are treated with hot alcohol, the fluid holding the acids in solution being received in a flask. The filter is washed with alcohol until it no longer reddens litmus, and the filtrate is made up to 100 c.c. with alcohol. Half of this is taken, coloured with a suitable indicator, and heated gently; deci-normal K Ho is run in and the number of cubic centimetres required for neutralization noted, the second portion is similarly treated. The first experiment serves as a guide to colour, &c.; the number of cubic centimetres used is ascertained, and the amount required by the non-volatile acids in 100 grammes of fat calculated. For the purpose of comparison with fats used as adulterants, it may, perhaps, be convenient to convert this to stearic acid  $\left\{ \begin{array}{l} \text{C}_{17}\text{H}_{35} \\ \text{C O Ho.} \end{array} \right.$

*Experiment 1.*—1.851 grammes of purified fat from good farm butter was taken. The solution containing the volatile acids was made up to 300 c.c. The distillate from 100 c.c. required 3.5 c.c. K Ho. This on 100 grammes of fat gave 4.31 K Ho or 6.7 butyric acid.

*Experiment 2.*—The alcoholic solution containing the non-volatile acids of the above was made up to 100 c.c. 48.8 c.c. of K Ho were required. This on 100 grammes of fat gave 18.14 K Ho or 92.0 stearic acid.

*Experiment 3.*—1.19 grammes of fat from another sample of the same class was taken. The solution containing the volatile acids measured 170 c.c. The distillate from 100 c.c. required 5.6 c.c. K Ho. This calculated on 100 grammes of fat gave 4.42 K Ho or 6.8 butyric acid.

*Experiment 4.*—The alcoholic solution containing the non-volatile acids of the above required 38.5 c.c. K Ho. This on 100 grammes of fat gave 18. K Ho or 91.7 stearic acid.

These results agree closely with those obtained by Dr. Koettstorfer. Thus—

	Per cent. of K Ho.
Experiment 1.—Volatile acids	4.31
Experiment 2.—Non-volatile	18.14
	<hr/>
	22.45
Experiment 3.—Volatile acids	4.42
Experiment 4.—Non-volatile	18.0
	<hr/>
	22.42

## AMERICAN BAKING POWDERS AND ALUM.

BY HENRY A. MOTT, JR. PH.D., E.M.

*From the Scientific American.*

HAVING been appointed Chemist by the United States Government for the Indian Department, it became my duty to submit to chemical analysis, among other articles, the various baking powders offered the department, and as a result of my investigation I found that at least fifty per cent. of the baking powders offered were grossly adulter-

ated. After making this discovery I determined to submit to analysis every baking powder I could find on the market, and to expose such powders as were adulterated, so that the public may be warned from purchasing them in the future. The number of baking powders I have examined amounts to forty-two—twenty-nine of them from various sections of the country having been offered to the department, and thirteen obtained from various grocery stores throughout the city of New York.

Instead of the baking powders of commerce being composed alone of those constituents which have been demonstrated to be perfectly harmless and wholesome, the public have imposed upon them powders largely adulterated with most injurious and hurtful compounds, put up in cans neatly labelled "chemically pure," as if that fact (?) had anything to do with rendering the powders wholesome. Scheele's green (arsenite of copper) is often "chemically pure," but it is always a deadly poison.

It, therefore, becomes necessary for the benefit of the public to examine into the the powders on the market, and to denounce such of them as are composed of constituents detrimental to health.

The best powders are composed of bitartrate of potash (cream of tartar), tartaric acid, carbonate of ammonia, and bicarbonate of soda, held together to prevent decomposition by a little starch.

The injurious powders are composed of alum and bicarbonate of soda, and often contain terra alba (white earth), insoluble phosphate of lime, &c., &c. The effect of alum when taken internally has been shown by Wilmer and others to produce dyspepsia, constipation, vomiting, griping, and even inflammation of the gastro-enteric mucous membrane, as it is a powerful astringent acting chemically on the tissues. These serious effects will not of course be brought about immediately from the small quantity of alum used in one loaf of bread, but it is certain that persons continuing to eat bread containing alum will, in time, suffer from its evil effects, and the weaker the constitution the sooner will the effects be noticed.

Duma speaks to the same effect when he says: "It is to be feared that this salt exerts a deadly action by its daily introduction into the stomach, especially in persons of a weak constitution." And other great authorities, such as Carpenter, Dundas, Thompson, Gibbon, and Normandy, all agree that the continued use of bread containing alum will bring about dyspepsia and other troubles, and such was the opinion of the late Baron Liebig. The celebrated Pereira considered "that whatever may have been the effect in the case of healthy persons, sick persons did really suffer in that way." In the *Lancet* is mentioned a case in whom dangerous gastro-enteritis was apparently induced by a single dose containing between ten to twenty grains of burnt alum. Dr. Parkes, in his work on *Hygiene*, states that from eight to forty grains of alum, and probably more, have been found in a four-pound loaf of bread.

The effect of alum on bread is to tend to whiten it, and to prevent an excess of fermentation (when yeast is used), when the altering gluten or cerealine acts too much on the starch; but while it accomplishes this object, it lessens at the same time the nutritive value of the bread by rendering the phosphoric acid insoluble.

Out of the many baking powders I have examined, I have selected the more prominent ones that are adulterated, giving in each case a quantitative analysis of the

same. The analyses of the last three baking powders given in the first column were made by Professor Robert W. Schedler.

		No. 1.	
Burnt alum..	.. .. .	.. .. .	26.45 per cent.
Bicarbonate of soda	.. .. .	.. .. .	24.17 " "
Sesquicarbonate of ammonia	.. .. .	.. .. .	2.31 " "
Cream of tartar	.. .. .	.. .. .	None
Starch	.. .. .	.. .. .	47.07 " "
			100.00

		No. 2.		Analysis by Dr. Mott.	
Burnt alum..	.. .. .	19.16 per cent	.. .. .	20.03 per cent.	.. .. .
Bicarbonate of soda	.. .. .	23.36 " "	.. .. .	22.80 " "	.. .. .
Cream of tartar	.. .. .	None	.. .. .	None	.. .. .
Starch	.. .. .	57.48 " "	.. .. .	57.17 " "	.. .. .
		100.00		100.00	

		No. 3.		Analysed by Dr. Mott.	
Burnt alum..	.. .. .	29.60 per cent	.. .. .	30.06 per cent.	.. .. .
Bicarbonate of soda	.. .. .	31.13 " "	.. .. .	31.82 " "	.. .. .
Cream of tartar	.. .. .	None	.. .. .	None	.. .. .
Starch	.. .. .	39.27 " "	.. .. .	38.12 " "	.. .. .
		100.00		100.00	

		No. 4.	
Burnt alum	.. .. .	22.53 per cent.	.. .. .
Bicarbonate of soda	.. .. .	21.79 " "	.. .. .
Cream of Tartar..	.. .. .	None	.. .. .
Starch	.. .. .	56.68 " "	.. .. .
		100.00	

Not one pound of these powders could be sold in England, as it is against the law to use alum for making bread. Why have we not such a law? A case is reported in the English Law Reports of 1871-2, 7th Queen's Bench, 135, November 15, 1871, where a baker was convicted for using alum in making bread. What would become of the above-mentioned baking powders containing alum if they were introduced on the English market? The answer is simple—they would be swept out of existence.\* It is to be hoped, then, that the public, by refusing to purchase them, will bring to them all the same fate.

By exposing these injurious and unwholesome baking powders, the public must not be frightened from using baking powders when properly made—of which I have already stated there are a number on the market. In fact, baking powders are a great convenience, as the constituents are so combined that their use is always attended with success: and there is no danger of biscuits made with them having an alkaline taste, or being impregnated with yellow specks or streaks, as is often the case when ordinary cream of tartar and soda are used. This results from the fact that the ordinary cream of tartar found in market is adulterated from 10 to 90 per cent. with foreign substances; consequently, it becomes necessary to change the proportion to be used with every new lot, which can only be correctly arrived at by a chemical analysis of the cream of tartar.

\* We fear the success of the English Act is not quite so complete as Dr. Mott seems to suppose.—  
[Eds. ANALYST.]

The advantages of using "baking powder" in preference to yeast, are that with the former none of the nutritive parts of the flour are destroyed, a larger yield is obtained, and the result accomplished with a great saving of time, which would otherwise be required to promote the fermentation when yeast is used.

The advantages of using "baking powder" in preference to the ordinary cream of tartar and soda found on the market are not only that it is more economical, but the results are always attended with success, there being no fear, as stated, of producing an alkaline taste or yellow streaks in the product.

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### CONDENSED MILK.

THE *Neue Freie Presse* has, very recently, published a series of letters and articles on the above subject, which possesses special interest for analysts, as bearing on Mr. Helmer's recent paper on the same subject, and the discussion which then took place.\* Unfortunately the correspondence and articles are throughout written in a tone of recrimination, which we have seldom seen in any English periodical treating on scientific subjects; such phrases as "insulting advertisements," and "to unmask calumniators," are plentifully scattered through the writings of both sides. This is the more to be regretted, as it only diverts attention from the real point at issue, which is simply whether the condensed milk manufactured by one of the foreign companies is produced by the concentration of genuine milk, or of skimmed milk.

The matter appears to have been originally brought forward by Dr. F. Sexhlett, and the analyses on which he bases his opinion appear to have been made in the ordinary course of his official work in the Imperial and Royal Chemical and Agricultural Institute, at Vienna. He quotes a very large number of analyses which he has made of samples from different condensed milk companies, but he considers the result of these analyses mainly by determining the ratio between the caseine and the fat. This is entirely different from the method adopted by Mr. Helmer, who deduced the concentration of the milk mainly from the solids not fat.

Dr. Sexhlett points out that the fat, in genuine milk, is in almost every case in excess of the caseine present. Thus he quotes König, who finds, on an average of 400 analyses of cows' milk, caseine to fat as 100 to 110; Fleischer, in 170 analyses, never found less than 100 parts of fat to 100 of caseine; G. Kuhn, in 173 analyses, only found 14 in which the fat was less than the caseine, the minimum being 88.5; while Dr. Sexhlett himself has in only one single instance found the proportion of caseine to fat as 100 to 87.

Referring, however, to milk from the Alpine districts, which is the class of milk that is mainly in dispute in this correspondence, a number of recent analyses are quoted, showing an average of 146 parts of fat to 100 parts of caseine as being the average produce of the districts.

Passing from the question of the composition of the original milk before concentration, a number of analyses are put forward of samples supplied by different condensed milk companies to show the proportion which the caseine and fat bear to

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\* See ANALYST, vol. iv., pp. 44 and 72.

each other in the finished product, and in four particular instances the results were as follows :—

							Proportion of Caseine to Fat.	
Tin from Vienna	..	..	..	..	..	..	100	66
" "	..	..	..	..	..	..	100	64
" Bruner	..	..	..	..	..	..	100	71
" Prague	..	..	..	..	..	..	100	73

From these facts Dr. Sexhlett comes to the following conclusions :—1st. The milk contained in each tin was differently composed, and therefore he did not possess samples of one and the same concentration, but of four different ones. 2nd. In every one of these four samples the relative proportion of fatty substances to caseine was such as is never found in ordinary milk from a cow, or even in the best milk from the Alps. Until now such a proportion was found only in skimmed milk, and it is evident therefore that the four samples, the analyses of which are given above, were manufactured with skimmed milk.

Further on, in Dr. Sexhlett's report, we find another analysis of a sample said to be the milk of the "Helvetia" Company, which probably corresponds with the samples bearing the same mark referred to in Mr. Hehner's paper, but the difference between the latter samples and that referred to here is remarkable. Although the amount of water is fairly concordant, Mr. Hehner's samples contained more than 2 per cent. less fat and about 1 per cent. less caseine; but it is unfortunate that no attempt was made to separate the cane sugar from the milk sugar in Dr. Sexhlett's sample, which is also viewed by him as a skimmed milk.

To justify the points he brings forward, Dr. Sexhlett gives quotations from the Report of the Commissioners on the projected German law affecting the sale of articles of food and consumption. As these quotations have not previously appeared in their entirety in our columns, it may be worth while to give them. The report (Berlin, 1878) states :

"Milk, in its ordinary composition, contains all the nutritive elements necessary to the human body, and that in a form which suits man. If, however, certain elements are wanting therein, such as *cream*, which is not only one of the principal integrant aliments, but which is also indispensable to the other component parts of milk, or should such a quantity of water have been added to the milk as to cause a deficiency in the daily quantity corresponding with the capacity of the bowels of the child, the result will be decline and consumption.

"When the first illness has once appeared, however harmless its symptoms may seem, a child may be carried off suddenly without being able to resist under such circumstances.

"Those selling skimmed milk, or milk understood to have lost part of its value by skimming, as whole milk, for the nourishment of children are, according to the facts before mentioned, for having jeopardised the health of children and sick persons, guilty of having prejudiced their health, and it shall no longer be considered a matter of hazard hereafter if the wholesale murder of infants, favoured by existing circumstances, shall continue or not.

"Skimmed milk is more or less deficient in fats contained in pure milk, and is therefore wanting in one of its principal component parts. It has therefore less value, and is unfit for the nourishment of young children. Its sale, under the name of whole milk, is not admissible."

All that was said by Mr. Hehner, and enforced by Dr. Muter and other speakers at the February meeting of the Society of Public Analysts, as to the danger of using condensed milk as infants' food when diluted in anything like the proportions directed on the tins in which it is sold, are echoed and enforced in this correspondence in even stronger language, the only misfortune being that, owing to the personal bias which

runs through the whole thing, the condemnation is applied principally to the milk of one or two companies, instead of being extended as it justly should be to all kinds of condensed milk. Especial attention, for instance, is drawn to the fact, that the directions on the cans state that when "diluted in a small quantity of water it becomes like the finest cream," while the simple fact is that the condensed milk itself contains less fat than even the poorest sample of cream which could be obtained. Dr. Sexhlett says, that "the height of impudence is reached when it is asserted that condensed milk is, without contradiction, the best food for children, and is far better than non-condensed milk."

Independently, however, of all this discussion, whether a certain milk is skimmed, there is one very serious point to consider, which concerns all who have to do with condensed milk, either in manufacture or for the purpose of analysis. It is confidently asserted by persons who have for a long time been preparing condensed milk that, not only does decomposition of the caseine occur during the boiling process, but that a by-no-means inconsiderable proportion of the fat distils over with the evaporated water, if the temperature in which the evaporation is carried on is allowed to rise sensibly above 100° F. If this is the case the milk loses doubly during the concentration—1st. There is an actual loss of nitrogenous matter by decomposition which will ensue, under any circumstances, by continued boiling in the presence of the large amount of cane sugar that is usually added, and which is still further increased by the fermentation frequently set up in milk that is not quite so fresh as might be desirable; and, 2nd. There is the large loss of fat which forms quite as essential a constituent of milk, and which is not only partly volatilized, but without doubt, under such circumstances, is partially decomposed during the volatilization, so that the fat which is left behind in condensed milk, provided any portion of the fat has been volatilized, would probably not have the composition of true butter fat, but would contain volatile and fixed acids in different proportions to those found in genuine butter.

This subject is certainly worth fuller investigation than it has received at present.

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#### SALE OF FOOD AND DRUGS ACT AMENDMENT BILL, 1879.

This Bill has passed through the House of Lords, and received the Royal Assent on the 21st July. We shall reprint the Act in our next number.

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EXTRAORDINARY REASON FOR COMMITTING SUICIDE.—An inquest was lately held by Mr. Payne, the City Coroner, into the circumstances under which Walter Hazell, aged forty-four, a milkman of 1, Walker Street, St. George's, Southwark, came to his death. Mrs. Hazell said the deceased was a man of robust health, although addicted to habits of intemperance. A few days previously one of the sanitary inspectors of the district called and purchased a sample of milk, at the same time telling deceased that the milk would be examined by the Public Analyst. This circumstance seemed to give deceased a great deal of anxiety, and he told more than one person of his apprehension of being summoned before a magistrate, and being fined. On the morning in question deceased rose as usual—very early in the morning, and upon his wife going down-stairs some time afterwards she missed him. Search was made, and Hazell was found with his head downwards in the water-butt in the back yard of the house. The jury returned a verdict of "Suicide whilst temporarily insane."

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ERRATUM.—In Mr. Allen's paper on Tinctures, page 106, line 7, read, "the proportion of oil of anise which could be dissolved by spirit of 30° U.P. (instead of O.P.) was a mere fraction of that taken up by proof spirit."



## ASSAY OF CRUDE CALCIUM ACETATE.

By AUGUST STROMEYER.\*

CRUDE CALCIUM ACETATE, sold for making acetic acid, is now often tendered for analysis. The author used to calculate the acetic acid from the amount of soluble calcium. A known quantity of the sample was dissolved in water, filtered and precipitated with ammonium hydrate and ammonium carbonate. The precipitated calcium carbonate was ignited to destroy organic matter, and dissolved in a measured quantity of standard nitric acid. By adding litmus and standard alkali the amount of nitric acid neutralised could be readily ascertained, and had only to be calculated to an equivalent amount of acetic acid. Other chemists prefer to evaporate the solution of the calcium acetate to dryness, and to ignite the residue instead of precipitating with ammonium carbonate.

This apparently simple method is not, however, satisfactory, since manufacturers of acetic acid can never get as much acetic acid as the analysis shows. The author thinks there is another acid present not volatile at the boiling point of acetic acid.

The following process given by Fresenius gives about 4 per cent. less acetic acid than the one described, but seems more satisfactory to the manufacturers:—5 grammes of the sample are put into a retort, mixed with 50 c.c. phosphoric acid of 1·2 sp. gr., and the whole distilled nearly to dryness. The distillation is repeated after adding 50 c.c. more of the acid, and then again by adding 50 c.c. of water. The acetic acid is estimated by standard alkali.

## THE CHEMISTRY OF AN ORANGE.

*From the Boston Journal of Chemistry.*

It proved so difficult a matter to find a clear and reliable analysis of the orange in the literature of chemistry that, previous to leaving this city for Florida, we determined that the work of analysis should be undertaken. A medium-sized Florida orange, purchased in Fanueil Hill market, afforded upon analysis the following results:

The skin weighed 57·5 grammes, which is 23·33 per cent.  
 „ seeds „ 7·0 „ „ 2·84 „ „  
 „ pulp „ 182·0 „ „ 73·83 „ „

The *skin* contained in 100 parts:

Water and volatile oil .. .. .	78·00
Organic matter .. .. .	21·36
Ash .. .. .	·64

The *seeds* contained in 100 parts:

Water .. .. .	50·00
Organic matter .. .. .	48·64
Ash .. .. .	1·36

The *pulp* contained in 100 parts:

Water .. .. .	90·99
Organic matter .. .. .	8·68
Ash .. .. .	·33

The pulp contained in 100 parts  
 4·3 grape sugar,  
 4·2 cane sugar,  
 1·0 free acid.

The free acid consisted of about equal parts of malic and citric acid.

\* *Correspondenz blatt des Vereines analytischer chemiker, Jahrg 2, No. 7.*

The ash constituents of the orange were as follows :

Potash .. .. .	38.7
Soda .. .. .	7.6
Lime .. .. .	23.0
Magnesia .. .. .	6.5
Ferric phosphate .. .. .	1.7
Sulphur .. .. .	2.9
Silica .. .. .	5.2
Phosphoric acid .. .. .	14.1

From these results it is seen that the orange is not a very great robber of the soil ; indeed, it would appear that the growth of fruit depends so slightly upon important inorganic constituents, that fertilization in good soils is hardly necessary. The food most largely drawn upon for the formation of skin, pulp, and seeds, is potash, and next come lime and phosphoric acid. In one hundred pounds of the fruit there are but two and one-third pounds of ash, and nearly one pound of this is potash. It is evident that ashes and phosphoric acid are the forms of food demanded in the growth of the orange, and on poor soils this may be supplied with advantage. It is found in Florida that in the cultivation of the orange great persistency in bearing is maintained, and in the apparently pure white sand of the State it flourishes for many years, and yields constant returns. This renders it a valuable and remunerative crop, and upon it Florida must largely depend for its resources.

#### WATER SUPPLY OF MONTREAL, CANADA.

WE have received from Dr. Baker Edwards, of Montreal, two small pamphlets on the character of the different water supplies of that town, and of the shore and river ice taken from the river St. Lawrence. The analyses of the ice show rather more organic suspended matter than we should have expected to have found, the shore ice containing two grains per gallon and the river ice one grain per gallon. These figures are, however, according to Dr. Edwards' analyses, considerably less than those which are frequently found in the unfiltered water supply of the city, and he takes the opportunity of pressing strongly upon the city authorities the necessity for efficiently filtering all the water before it is supplied to the town. The main feature in connection with the analyses of some twenty-five samples of the different river waters is their extreme softness, and the small quantity of animal matter which they contain ; and it certainly is very singular that the one sample of the town supply should, in both these respects, as well as in the amount of organic carbon which it contains, stand very greatly at the head of the list as the most impure water. This would seem to indicate not only that filtration is neglected, but even storage of the water must be very inefficiently carried out at Montreal.

#### SOCIETY OF PUBLIC ANALYSTS.

THE Country Meeting of this Society will take place at Sheffield during the Meeting of the British Association, and will probably be fixed for the afternoon of Friday, 22nd August, in the Library of the Literary and Philosophical Society, Arundel Street.

The usual Notice will be sent to Members.

## REVIEWS.

*An Introduction to the Practice of Commercial Organic Analysis.*

By ALFRED H. ALLEN, F.C.S. London: Churchill.

It is refreshing to meet with a new work on Chemistry, having a real *raison d'être* like that possessed by the book before us. It professes to be a treatise on the properties, proximate analytical examination, and modes of assaying the various organic chemicals and preparations employed in the arts, manufactures, medicine, &c.; with concise methods for the detection and determination of their impurities, adulterations and products of decomposition, and it is introduced by the author with the following forcible remarks:—"While the libraries of chemists are replete with manuals and treatises on inorganic analysis, and the number of these works is being increased almost monthly, books on organic analysis are chiefly conspicuous by their absence. It is a lamentable fact that while our young chemists are taught to execute ultimate organic analysis, and to ring the changes on the everlasting chloro-bromo and nitro-derivatives of bodies of the aromatic series, the course of instruction in many of our leading laboratories does not include even qualitative tests for such every-day substances as alcohol, chloroform, glycerin, carbolic acid and quinine. As a natural consequence of this neglect, the methods for the proximate analysis of organic mixtures and for the assay of commercial organic products are in a far more backward state than is justified by the inherent difficulties of this branch of analysis." These strictures are unfortunately but too true, and, as we have again and again had to point out, the tendency of the present would-be leaders of chemistry in England is to ignore the workers in purely analytical research and exalt the "organic manufacturing investigators." There are, however, many signs of a re-action setting in, and the time will come when the practical researches of the analysts, whom we represent, will be more thought of than those of the persons who now profess to hold us in contempt.

Such being Mr. Allen's excellent ideas in commencing his work, let us see how far they have been followed up. In the first place, the author intended to practically verify every process personally, but after some years of labour he found that not only was the work beyond the power of any one man, but that even when carried out the information obtained would most probably become stale long before the whole work could be finished, and he has therefore published the present volume as an instalment of what is to follow. Opening with the cyanides, this volume takes us through the alcohols, simple, haloid and compound ethers, and the chief acids, ending with the phenols and their acid derivatives. The second volume is to contain oils, fats, soap, and essential oils, although certain of the latter which are chiefly aldehyds, or compound ethers are included in the first volume. The author apologises for not making his style more "telegrammatic," but we think had he done so, he would have spoiled the work, which has just that judicious amount of "padding" necessary to commend it to more elementary readers, while the processes are described in a manner sufficiently detailed, and yet not so much so as to be wearisome to the professional men for whom the work is chiefly intended. We are spared the stereotyped descriptions commencing with—"take a basin," or "put into a burette," and the strengths of the various solutions are

indicated once for all in a table at the beginning of the book, and afterwards simply referred to as "deci-normal," "normal," &c., which saves many vain repetitions. It would be impossible to go into all the various processes mentioned and criticised in the book, but we may say that there are few works where so much real practical information is condensed within 350 pages. To many the book would be worth buying, even if it had nothing else than the excellent article on the detection and estimation of alcohol, and the carefully compiled tables therein contained, enabling an analyst to tell with the greatest facility the exact amount of water which has been added to a bulk of gin of any given strength, to reduce it to the strength found. We shall look anxiously forward for the next volume of Mr. Allen's work, because the present is certainly one without which no analyst's library can be considered complete, and which in a marked degree advances the already high reputation of its author. To Public Analysts, who are so much engaged in organic work, it is simply invaluable, and it has the merit of also being fairly well printed, although the author here and there suffers from the terrible havoc compositors are apt to make with chemical symbols. A work on chemistry without such errata would, however, be a thing we might wish for but never meet with, and in the present case the errors are commendably few.

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*On the Estimation of Phosphoric Acid, by Magnesia, for Commercial Purposes.*

By E. F. TESCHEMACHER AND J. DENHAM SMITH. London: Hardwicke, 1879.

THIS brochure is devoted exclusively to the consideration of the process which Messrs. Teschemacher & Smith have for some years employed in their commercial analyses. Its publication at the present time is the more satisfactory, because the authors' process has always, rightly or wrongly, been looked upon as a secret one.

We must refer our readers to the publication itself for the details of the process, as we have only space to point out that its principal features consist in the solution of the mineral phosphates in concentrated hydrochloric acid, so as to ensure expulsion of all the fluorine in the precipitation of the lime by adding the boiling solution of the sample to a solution of oxalic and citric acids, and then completing the precipitation by a very gradual addition of ammonia water, the solution being acidified with acetic acid before filtration, and in invariably re-dissolving and re-precipitating the ammonia magnesian phosphate.

As the result of many experiments the authors conclude that ammonia magnesian phosphate is practically insoluble in ammonia water.

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*The Gas Analyst's Manual.* By F. W. HARTLEY. London: Spon, 1879.

MR. HARTLEY'S name is so well known in connection with gas testing apparatus that we naturally expect to find a high standard of accuracy and excellence in the work before us, and we are not disappointed. The work does not profess to introduce any new methods or processes, but it is a carefully prepared *resumé* of all the processes in use for gas analysis. Prior to the publication of the book, there was no comprehensive work published which gave the gas analyst all the necessary instructions for performing the ordinary routine of gas testing. As far as London is concerned, the gas referees'

instructions gave all the necessary information to carry out the tests according to the method prescribed by them, but these instructions were not generally available. Mr. Hartley has wisely embodied these instructions in the present volume. The description of the various prices of apparatus employed, and the modes of testing and adjusting them is carefully written.

The book will be of special value to those who are only called upon to test gas occasionally.

*Ammonia Liquor Tests.* By F. W. HARTLEY, 85, Millbank Street, S.W.

THIS is a handy little pamphlet, but its main value consists in its being another determined blow at one of those crude processes of so-called analysis which have been retained in our Chemical Works long after their fallacies have been exposed in the Laboratory.

The author points out the great errors incurred by estimating the strength of gas liquor by the specific gravity, or by simple titration instead of by distillation and titration.

### CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

#### TO THE EDITOR OF "THE ANALYST."

SIR,—In the month of February I made an official inspection of some cow stables, at a place called Blissville, on Long Island, which were connected with a distillery. Thinking that my investigations at that time might prove of some interest to yourself and other Public Analysts, I take the liberty of writing you upon the subject.

At the time of my visit to the above stables there were between 700 and 800 cows in them, crowded into narrow stalls, to which they were fastened by a rope not more than three feet in length, which barely permitted them to lie down, but kept their mouths continually at a trough into which flowed the "swill" from the adjacent distillery in a steaming and fermenting condition.

Most of the animals were emaciated and feverish, and were affected with cough, diarrhoea, and polyuria. Some appeared to have recently arrived, and were in good condition. The temperature of several of the animals was noted, and ranged from 102° to 109°. The stable floors were kept all the time wet and slippery with excrementitious matters, and I did not see how it was possible for the cows to be milked and prevent the surrounding filth from splashing into the milk.

These poor creatures, crowded together within low sheds, with insufficient food, imperfect or no means of ventilation, no exercise, no pure water to drink, and breathing an atmosphere poisoned by the exhalations from their wretched bodies, their excretions, and the steaming and fermented food, are expected, under these conditions, to secrete milk fit for human consumption.

I obtained some milk from two cows, each specimen of which I submitted to analysis. It is of the quality one would expect it to be from animals fed on such food and kept in such unsanitary surroundings.

I. Re-action one hour after milking, very acid. Cream, 5½ per cent. by volume.

Average of two analyses:—

Water	..	..	..	..	..	89.18
Fat	..	..	..	..	..	1.28
Sugar	..	..	..	..	..	4.66
Caseine	..	..	..	..	..	4.225
Ash	..	..	..	..	..	0.655
						100.000
Solids, not fat	..	..	..	..	..	9.54

## II. Re-action, acid. Cream, 4 per cent. by volume.

Average of two analyses :—

Water	..	..	..	..	..	89.80
Fat	..	..	..	..	..	1.19
Sugar	..	..	..	..	..	4.18
Caseine	..	..	..	..	..	4.16
Ash	..	..	..	..	..	0.67
						100.00
Solids	..	..	..	..	..	9.01

Examined microscopically, the fat globules were very small, scanty, and aggregated, and I also observed some epithelium, and cells resembling those found in colostrum.

I have the honour to remain, very respectfully,

J. BLAKE WHITE, M.D.,

Inspector of Milk, City, New York.

NEW YORK, June 18th, 1879.

## ANALYSTS' REPORTS.

Mr. J. Carter-Bell, Public Analyst for Cheshire, has reported to the Court of Quarter Sessions that during the past quarter he examined 148 samples. These were—62 of milk, 24 water, 18 bread, 15 flour, 9 whisky, 8 coffee, 4 gin, 2 brandy, 2 pickles, 1 rum, 1 vinegar, 1 oatmeal, and 1 chocolate. Of these 23 were adulterated, consisting of 15 milks, 5 whiskies, 1 brandy, 1 gin, and 1 coffee. The report also stated that in Cheshire, a county where the pasture was exceptionally good, and where excellent milk should be produced, the average of the samples taken was exceptionally bad, nearly one-third being below the ordinary standard of poor milk. In Salford, where the milk was very closely watched, it was difficult to find an adulterated sample.

Mr. J. Carter-Bell, Public Analyst for Salford, in his report for the quarter ending 30th June, states that he examined 136 samples, consisting of 47 breads, 57 milks, 15 buns, 10 flours, 2 teething powders, 2 medicines, 1 butter, 1 cider cream, and 1 egg-powder. Of these 10 were adulterated, consisting of 6 milks, 2 buns, and 2 breads. The greatest amount of water in the milk was 15 per cent. One sample of bread contained as much as 45 grains of alum to the 4lb.-loaf. The cider cream, which he believes is chiefly sold to children, was composed of strong vinegar slightly flavoured with a little acetate of amyl. The teething powders were composed of metallic mercury, morphia, and chalk. At the end of the last and the beginning of this quarter the adulteration of bread with alum was prevalent, but owing to the increased vigilance of the inspector, not a sample of alumed bread could now be found."

Mr. J. Baynes, Public Analyst for the East Riding of Yorkshire, reports that during the past quarter, 42 samples were submitted to him, viz.:—2 arrowroot, 1 bread, 3 butter, 1 baking powder, 7 coffee, 1 cocoa, 2 ginger, 4 lard, 7 milk, 1 mustard, 8 nitre, 2 oatmeal and 2 pepper. Of these 5 samples of nitre were adulterated—4 were brought from grocers and 1 from a tailor. 3 coffees contained 16, 30, and 48 per cent of chicory respectively. 1 lard 15 per cent of water, 1 milk 10 per cent of water.

Mr. Baynes also reports that as Analyst for Hull, he examined 2 samples during the quarter, viz.:—1 water and 1 milk both of which were pure; these were sent by the medical officer, owing to Scarlet Fever being prevalent.

MR. CARTER-BELL writes to request us to draw attention to the fact that the tables in his paper on alum in flour and bread, published in the ANALYST for July, are calculated on the basis of 3-lb. of flour per 4-lb. loaf, an amount which is in excess of the quantity usually employed, and since adopted by him as a basis of calculation.

"THE PREJUDICE QUESTION."—For the information of analysts who may possibly have to refer magistrates to the recent decision on this point in *Hoyle, v. Hitchman*, we may state that that case is now reported in *Law Reports*, 4 Q.B.D., 233; 48 *Law Journal*, M.C. 97; 40 *Law Times*, 252.

## LAW REPORTS.

**HEAVY FINE FOR BUTTERINE.**—At the Sittingbourne Petty Sessions, Mr. Samuel Wood, grocer, of Milton-next-Sittingbourne, was summoned for selling as butter, an article not of the nature, quality, and substance of the article of food demanded by the purchaser, a policeman named Kelway. Police-superintendent Mayne produced the certificate of Mr. M. Adams, Analyst for Kent, which was to the effect that the article was not butter at all, but was a substance made to resemble butter, and that it contained nothing unwholesome. Mr. Wood stated that the article was butterine, and was intended for cookery purposes, and was so labelled in his shop, but his assistant in his absence omitted to tell the purchaser that the article was butterine on his asking for butter. The Bench imposed a fine of £5 and 15s. costs.

**"NORMANDY ROLL BUTTER."**—Mr. William Nettleton, grocer and provision dealer, Northgate, Huddersfield, and who has a stall in the Market Hall, appeared before the Borough Magistrates to answer a charge of having sold a pound of some article as butter which was not of the nature, substance and quality as demanded by the purchaser. The evidence for the prosecution showed that the defendant's assistant at his stall in the Market Hall sold to a youth named Liversedge, who had been sent by Mr. E. G. Kirk, the Sanitary Inspector, a pound of roll butter, which was taken from a quantity labelled "Normandy roll," telling him, however, that he could not guarantee that it was all butter. Mr. Jarmain, the Borough Analyst, found that the sample submitted to him was mainly composed of foreign fat, and was really an article known as "butterine." The question was whether the article usually known in the trade and by the public as "Normandy roll" was a pure butter. Evidence was given by several provision merchants that there was a pure butter known by that name. The defendant called a witness, who said he had been in the provision trade twenty-seven years, and did not know till three years ago that there was a butter called "Normandy roll." The Bench ordered the defendant to pay a fine of 10s. and costs, adding, however, that they did not think the defendant had wilfully offended against the law.

**ADULTERATED MILK.**—Joseph Smith, Braunston, was charged at the Daventry Petty Sessions, with selling adulterated milk. Inspector Phenix said he called at the defendant's house on the 6th of May. He saw defendant's wife, and asked her if she sold milk. She replied, "Yes." He said, "Then I'll have half a pint of new." She gave him some, and said, "This is what we sell for new." He said, "I am purchasing under the Act, and want it for analysis." She said, "This has been skimmed once, but you can have that that has not if you choose." He said he would rather have that, and she fetched him a fresh lot. He then divided it into three parts. One he left with Mrs. Smith, one he retained, and the other, numbered 32, he took to Dr. Emmerson on the 8th, and now produced the certificate of the analysis, which stated there was 10 per cent. of water. The defendant said he was not a milk seller, and called his wife to state the case for him. Mary Ann Smith said the inspector asked for some new milk, which she does not sell, but she thought he wanted some to drink, and she told him the milk had been set some time, and should not be disturbed, but to oblige him she would let him have some. She put no water to it except the swillings of the buckets, which they always did to make the cream rise. There was about a pint and a half to between three and four gallons of milk. The Bench did not consider this to be a case of deliberate fraud on the public. If parties wish to set the milk for making butter, it should be kept apart from milk to be sold. The fine would only be 1s. and costs 10s. 6d. The defendant and others should be warned.

John Goode, was charged before the Biggleswade (Beds) Bench, with having sold a quart of adulterated milk to Supt. Bedlow, the Inspector under the Act. The defendant failed to prove the purity of the milk, although he sought the analysis of a medical man as against that of the County Analyst, who said that the milk contained 24 per cent. of water. A fine of £5 and costs was inflicted.

**BUTTERINE AND MILK.**—Jenkins Jones, cowkeeper, of 3, Teesdale-street, Hackney, and Henry Kennedy, dairyman, of 189, Cassland-road, South Hackney, appeared at Worship-street, to summonses, taken out by the sanitary authorities of South Hackney, charging them with selling milk adulterated with water. Jones was fined 10s. and costs, and Kennedy 20s. and costs.

Joseph Coon, of 2, Fashion-street, Spitalfields, shopkeeper, was fined 60s. and 2s. costs, on the complaint of the sanitary authorities of Christ Church, Spitalfields, for selling as butter an article containing 70 per cent. of "foreign" fat, the certificate also stating that it was doubtful if there was any real butter in the composition.

At the Wolverhampton Police-court, John Lilley, grocer, and also a member of the Wolverhampton Corporation, was summoned for selling a quantity of coffee mixed with chicory. Mr. Underhill, Town Clerk, prosecuted on behalf of the Corporation, and Mr. Stirk defended. Mr. Underhill, in opening the case for the prosecution, said it was an extremely simple one. Mr. Dawson, the Inspector for the

Corporation, sent a person named Williams into the defendant's shop on the 17th April to purchase half a pound of coffee. Dawson was standing outside the shop window at the time, and saw Williams supplied with a half-pound tin of coffee, which he brought to Dawson, who told him that was not what he wanted, and he required some to be weighed up. Williams returned to the counter and told the assistant what he required, and he was then served with another lot, and when about to leave, Mr. Dawson joined him, and told the assistant that he was going to have the coffee analysed. The assistant replied that what had been supplied to Williams was genuine coffee. Mr. Dawson then divided the coffee into three lots, leaving one with the assistant, taking one to Mr. Jones, the County Analyst, and retaining the third portion himself. Mr. Jones, in his certificate, stated that the sample of coffee contained 20 per cent. of chicory. Mr. Lilley was entitled to sell coffee mixed with chicory, but he must put a label to that effect on the paper in which it was wrapped. Mr. Jones, the analyst, stated that 20 per cent. was not a large adulteration; the sum of 10d. was, however, a large price for half a pound of coffee. For the defence, Mr. Stirik said he could, if he chose, raise a technical objection which would completely upset the prosecution; but at his client's request he would not do so, but meet the case fairly and straightforwardly. Mr. Lilley was engaged in a large wholesale business in addition to having two retail shops. For the sale of ground coffee he kept a canister, divided into four compartments. Each of these compartments was used for various qualities of coffee, and a porter he kept was instructed to fill up these compartments as coffee was sold from them. In filling up these compartments, the porter might make a mistake, and put the genuine coffee into a compartment intended for a mixture of coffee and chicory, and put the mixed coffee and chicory into the compartment set apart for genuine coffee. Mr. Lilley was then called, and, in answer to the Bench, he said the mistake had been made by his porter. After briefly consulting together, the Mayor said the Bench were unanimous in their decision. They considered that Mr. Lilley's arrangements in his shop were not so satisfactory as they might be, and they suggested that he should improve them in some way. Defendant would have to pay a fine of £5 and costs.

**ADULTERATED BUTTER.**—At Marlborough Street, Mrs. Elizabeth Treleaven, provision dealer, Moor Street, was summoned before Mr. Mansfield by Mr. Angels Crisp, Inspector of Nuisances for the Strand District Board of Works, for selling adulterated butter. The butter having been proved to be largely adulterated, Mr. Mansfield, in fining the Defendant 10s. and costs, remarked that the persons who supplied small tradesmen with adulterated butter were the persons who should be proceeded against, as they made the largest profits by these impositions. This makes the fourth case of a similar character within about a week.

At the Lambeth County Court, recently, the case of *Styles v. Baker* was heard. The plaintiff claimed £6 for milk supplied. The son of plaintiff, a wholesale milk-dealer, of Vassall Road, Brixton, proved the delivery of the milk. Mr. Cosedge, who appeared for the defence, said his client took a sample of the milk to the sanitary authority of the Lambeth Vestry, by whom it was handed over to Dr. Muter, for analysis, and he certified that the "milk" was adulterated with 20 per cent. of water. But for the reasons which the doctor stated in his report, he did not advise proceedings to be taken until another sample of the milk had been analysed. In answer to his Honour, Mr. Cosedge admitted that his client had not paid for the last week's supply, which formed the ground of the present action, and his Honour gave judgment for the plaintiff, with costs and short order.

**ADULTERATED COFFEE.**—At the South Staffordshire Stipendiary's Court, Joseph Meddings, grocer, Bilston, was summoned for selling adulterated coffee. Mr. Vaughan appeared for the defendant. Samuel Toy, assistant to Mr. Horder, stated that on May 27th he visited the defendant's shop and purchased a quarter of a pound of coffee, and informed the servant who supplied him that he was going to have it analysed. In answer to the Bench, witness said he paid 4d. for the coffee. Witness, continuing, said the servant spoke to Mrs. Meddings, and the latter then said the article was a mixture of chicory and coffee. In reply to Mr. Vaughan, witness said that by Mrs. Meddings' directions, after he had told the servant his purchase had been made for analysis, the servant wrapped the coffee in a paper on which was a printed intimation that the contents included a quantity of chicory. Mr. Horder submitted the certificate of the County Analyst, which stated that the coffee was adulterated with 85 per cent. of chicory. Mr. Horder added that pure coffee could be supplied at 1s. 4d. per pound, whilst chicory was about 5d. per pound. Mr. Vaughan contended that the charge ought not to have been brought into court, inasmuch as the defendant was shielded against the charge by the coffee being wrapped in the printed paper. The wife of the defendant stated that immediately Toy asked for the coffee she told the girl in the shop to reach a paper marked "chicory and coffee," and the coffee was wrapped in one of these, witness again reminding Toy of the fact when he said the coffee would be



analysed. They sold some coffee at 1½d. for two ounces. The Deputy Stipendiary remarked that he should think the coffee at 1½d. for two ounces was all chicory. He, however, felt a difficulty in deciding the question which was raised by the defence set up, and he would therefore postpone his judgment.

At the adjourned hearing, held on the 18th July, Mr. Dallow appeared on behalf of the county authorities for the prosecution, and Mr. Vaughan for the defendant. Mr. Dallow obtained permission to make some observations on a question of law as to whether the sample was sold to the prejudice of the purchaser. He called attention to the fact that this was a sample of chicory adulterated with coffee instead of otherwise, and was sold at the rate of pure coffee. If a person bought a mixture at a high price he was entitled to a fair mixture, which was not so in the present case. In reply, Mr. Vaughan said the defendant took the precaution to put the word "chicory" before the word "coffee" on his label. It was sold as a mixture, but if too much money was paid for it that was the fault of the purchaser. In giving his decision, Mr. Haden Corser (the Deputy Stipendiary) said it appeared that Mr. Horder's assistant knew at the time he bought the sample that it was a mixture. He had not to inquire into the proportions of the mixture, because it was not for him to state what trade profits should be realised. If people chose to deal with those who made large profits, that was their own fault. After giving the case his most careful consideration he had come to the conclusion that he must dismiss the summons. Mr. Dallow made an application for the case to be argued in a superior court, and the magistrate granted the request.

**ADULTERATED BUTTER.**—At the Bow Street Police Court, Thomas Dodd, 27, Duke Street, Bloomsbury, was fined 40s. and 4s. 6d. costs for selling adulterated butter. The article was purchased at 1s. 4d. per lb. by an excise officer, who stated afterwards that it would be analysed. The shopkeeper then exhibited a printed intimation of the fact that it was sold as a "compound," but it was in such small type that Mr. Vaughan considered it an evasion rather than a compliance with the Act, for it almost needed a microscope to read it; besides which the fact should have been stated at the time the purchase was being made.

**ADULTERATED BUTTER.**—At the Gosport (Hants) Police Court, John Petman, grocer, of High Street, was summoned for selling to Police-sergeant Abraham, to his prejudice, an article which was not of the nature, substance, and quality demanded. Mr. George Feltham defended. The police-sergeant purchased three-quarters of a pound of (so-called) butter at defendant's shop, and the article was analysed by the County Analyst, Mr. Angell, who certified that it consisted of 98 per cent. of fat other than butter fat. Mr. Feltham said he had submitted some of the butter to the analysis of Dr. Turner, analyst of the Borough of Portsmouth, and his testimony was the same as the County Analyst, so he must plead guilty to the offence. His client, however, who had been in business many years, was perfectly innocent in the matter, having purchased the butter in the ordinary way of business from a merchant in Portsmouth, who had obtained it from the shippers in France. If the Bench would allow his client to have the butter which was left out of the purchase, he would bring an action against the merchants. The Bench said it was perfectly competent for the defendant to have taken a warranty with the butter, and Mr. Feltham replied that his client had unfortunately omitted to do that. The magistrates, taking all the facts into consideration, imposed a fine of 10s. and 18s. 6d. costs.

**"FRAUDULENTLY INCREASING BULK."**—At Faringdon Petty Sessions, Mr. George Liddiard, grocer, of Faringdon, was charged with having sold to Stephen Sheppard half a pound of coffee which was not of the nature, substance, and quality of the article demanded. Mr. Haines appeared for the defendant. It was shown that Sheppard, a constable at Reading, acting under the instructions of the Chief Constable, went to the defendant's shop in plain clothes, and asked for half a pound of coffee. The coffee was weighed out, wrapped up in paper, and delivered to him across the counter. The constable then requested the assistant who had served him to call his employer, the defendant, which he did, when the constable informed him that he had purchased the article with the intention of submitting it for analysis, and offered to divide it into three portions, and give the defendant back one portion, so as to allow him an opportunity of having that portion analysed on his own behalf. This the defendant did not require him to do, and he then called the purchaser's attention to a printed label affixed to the outside of the package, bearing the words, "This is sold as a mixture of coffee and chicory." The constable replied that he did not ask for coffee and chicory, but for coffee only. The article was afterwards submitted to the county analyst, Mr. Donkin, who certified it to contain forty parts of chicory with sixty parts of coffee. Mr. Haines, for the defendant, submitted to the magistrates that as a printed label had been delivered to the purchaser with the coffee, stating that it was sold as a mixture, the case against the defendant must be dismissed, as he had complied with the requirements of the Act, which provided that no person should be convicted of the offence charged, if at the time of sale he

delivered with the article a label describing it to be mixed. The magistrates retired to consider their decision, and then stated that considering the extent to which the coffee was mixed with chicory—40 per cent.—and that the price paid for it was the usual price for unadulterated coffee, they were of opinion that the article was mixed with intent fraudulently to increase its bulk within the meaning of the Act of Parliament, which took the case out of the protection afforded to the seller by the section referred to by Mr. Haines, and they convicted the defendant in the penalty of £5, and £1 0s. 6d. costs. The defendant paid the amount, but Mr. Haines applied for a case for the opinion of a superior court. The magistrates said they could have no hesitation in granting this.

**ADULTERATED MUSTARD.**—At the Wantage Petty Sessions, on July 16, before Rev J. F. Collins (Chairman), T. L. Goodlake, and E. H. Morland, Esqs., Mr. E. Radbone, of Oxford, the proprietor of the "King Alfred's Grocery Warehouse" in Wantage, was charged with selling to Police-constable Sheppard, and to his prejudice, a quarter of a pound of mustard, which was not of the nature, substance, and quality demanded. Mr. L. Jotcham prosecuted; Mr. Radbone conducted his own defence. Stephen Sheppard stated that acting under orders from Colonel Blandy, the Chief Constable of the county, he went to defendant's shop on May 23rd and asked for some mustard. Mr. Blades (defendant's manager) served him, and inquired what sort he would have, naming the prices; he said he would have a quarter of a pound of that at 1s., the lowest of the prices named by Blades. It was wrapped up in a coloured wrapper, on which, among numerous other printed matter, were these words: "In the preparation of this condiment no injurious ingredient has been used." When he had paid for the mustard he told him for what it was wanted, and divided it into three parts, giving Mr. Blades one, and handing the remaining two to the superintendent of police. Mr. Blades did not say anything about it being a condiment when weighing it up. Superintendent O'Neill proved sending one of the samples to the County Analyst, and produced that gentleman's certificate that the mustard was adulterated with 40 per cent. of flour and turmeric. Mr. Radbone admitted that it was adulterated, but contended that it was sold as a condiment, and that that fact, together with it being labelled, protected him. He then called Alfred Blades, who deposed that when he was wrapping up the mustard the police-constable said to him, "Do you sell this as mustard?" He said, "No; I sell it as a condiment, which information you will find on the wrapper." Cross-examined by Mr. Jotcham: Cantell, another assistant, was in the shop, and heard all that passed. The transaction lasted about five minutes. The policeman asked for tea and mustard. The mustard was taken from the bulk in a drawer. Any customer who wanted a small quantity of mustard would have it supplied in the yellow paper. The printed part of the paper would be outside the mustard when wrapped up. Cantell, who had not heard any of the evidence, was then sent for, and corroborated the evidence of Mr. Blades as to his having informed the policeman it was a condiment when weighing it up. When the policeman was asked what mustard he would have, he said the cheap. Cross-examined: He was busy serving other customers, and did not take a lot of notice of what was going on. Customers were continually coming in and out. He did not know what made him listen on this occasion. It was nothing unusual for a man to purchase a quarter of a pound of mustard. By Mr. Goodlake: It was the policeman's tone in asking whether it was pure mustard that attracted his attention. The policeman was recalled, and stated that there were two weighings, and it was on the second weighing, to divide the mustard into three lots (after Mr. Blades knew what the mustard was wanted for), that he was informed it was a condiment. Cantell was also recalled, and said he thought it was at the second weighing; but Mr. Blades was positive as to having told the constable it was a condiment before it was purchased. The Bench dismissed the case.

**FORTY PER CENT. OF ARSENIC IN FRENCH CHALK.**—On July 9th, Mr. Hill, Deputy-Coroner for Huddersfield, held an inquest on the body of Hetty Blackburn, aged 31 years, the wife of William Blackburn, of Marsh. The evidence showed that the deceased was pregnant, and as she suffered from heartburn her husband went on June 28th to the shop of Mr. T. N. Swift, chemist, Cross Church Street, and ask for some prepared chalk. Mr. Swift did not ask what it was required for, but thinking it was for a similar purpose to that for which chalk is used by shoemakers, supplied French chalk from a box containing a portion of a large quantity which he purchased from the Ultramarine Company, of Manchester, two years ago. The deceased took some of the chalk, and was subsequently seized with vomiting. On June 30th, Mr. D. Wilson, surgeon, of Paddock, was called to see the deceased, and found her in labour and vomiting, and she was delivered of a child, which was born alive about 35 minutes after his arrival. On Tuesday she seemed easier, but on Wednesday she died. As Mr. Wilson suspected poisoning, the police took possession of the box from which Mr. Swift supplied the chalk, and it was found by Mr. Jarmain, borough analyst, to contain 40 per cent. of arsenic. By direction of the coroner, after the inquest had been opened last Friday night, Mr. Wilson, surgeon, made a *post-mortem*

examination of the body of the deceased, in the presence of Mr. Jarman and Mr. Knaggs, surgeon, and the medical men came to the conclusion that death was the result of arsenical poisoning. Mr. Jarman examined the contents of the deceased's stomach and found arsenic. Mr. Swift now stated that had he known the chalk contained arsenic he should not have sold it at all, and that as it was, had he known Blackburn required the chalk for medicinal purposes he should have sold him another article altogether. The jury returned a verdict that the deceased died by misadventure, but recommended Mr. Swift to be more particular in future in selling exactly what was asked for, and that the question should be asked of the purchaser what the particular article was intended for, because although French chalk might not be poisonous, it would not be altogether wholesome. The deputy coroner trusted that Mr. Ward, the chief constable, would inquire further into it. Mr. Ward said he would do so at once. Mr. Swift said he should be happy to supply any quantity of the powder he had left, and stated that he had tried to get some analysed by the Chemists' Society at Birmingham, but they had sent the sample back, saying the society did not undertake to appear in police cases. The deputy coroner said the jury did not think there was anything criminal or negligent in the case sufficient to justify criminal proceedings.

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### NOTES OF THE MONTH.

We call the attention of our readers to the very interesting communication from Dr. Blake White, the Inspector of Milk, of New York, giving the results of the analysis of the milk of cows undoubtedly placed in a most unsanitary locality, and fed on the most undesirable materials. This letter is the more interesting to us, as Public Analysts, because it proves that the limit of solids not fat (9 per cent.), fixed by our Society as the lowest valuation of any sample of mixed milk, holds good even when such extreme tests of bad food and unhealthy lodgings are applied. The lowest point reached by these cows is 9.01 solids not fat, and yet we hear every now and then of the limit of 8.5 being applied, because in one or two isolated cases single cows have given milk said to be as low as that. It is a certainty that, for one sample of genuine mixed milk, which falls even so low as 9, there are hundreds which mark at least 9.8; and it is, therefore, a painful but certain fact that, judging by the 8.5 limit, every milk vendor in the kingdom can, with perfect impunity, put in 10 per cent. of water, and often more, and yet the analysts, constrained by those in authority, are compelled to certify the article as genuine, when they well know to the contrary. Of course no milk can be honestly judged by the solids not fat alone in cases where there is excess of fat; but our remarks apply to ordinary well-balanced samples, and we hold that, in such cases, the limit should be 9 per cent., as giving quite sufficient margin to any honest cow-keeper. It is almost a pity that, in fixing a limit for spirits, the legislature did not also enquire into the milk question, when we are satisfied the great mass of scientists, who make a speciality of food, would have supported our Society's limit, and made it illegal to sell milk under 9 solids not fat, without declaring it at the time of purchase.

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Some wonderful instructions for the quantitative analysis of milk have lately been published in the *Dairyman*, which, by the way, is now known as the *Provisioner*. Here is that authority's receipt for making Fehling's solution—

"The standard copper solution is prepared by dissolving 34.65 grains of crystals of cupric sulphate in 200 c.c. of water. To this solution is added a solution made by dissolving 173 grains of potassium-tartrate (Rochelle Salts) in 480 c.c. of sodic hydrate of specific gravity 1.14. The whole is diluted till it occupies the volume of one litre. The standard solution, so prepared, is of such a strength that 10 c.c. are equivalent to 0.067 grains of milk sugar (dry at 100° C)."

The mixture of the English and metrical systems of weight and measure contained in the above is at once startling and amusing.

We are indebted to the *Pharmaceutical Journal* for the following:—"M. Carles recently called the attention of the Bordeaux Pharmaceutical Society to the presence in commerce of quinine containing an exaggerated quantity of water. A sample examined lost 17 per cent. of water when dried at 100° c., or 5 per cent. in excess of the normal quantity. The same sample was found to contain a quantity of quinidine. M. Dambier said that he had recognised the same fact several times in sulphate of quinine obtained from good houses."

### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price.
4595	C. F. Heinrichs .. .. .	Apparatus for Generating Electric Currents .. .. .	10d.
4626	St. G. L. Fox .. .. .	Electric Lighting .. .. .	8d.
4645	J. S. Sellond and W. Ladd .. .. .	Obtaining Electric Light .. .. .	6d.
4662	J. T. Sprague .. .. .	Producing Electric Light .. .. .	6d.
4762	Ditto .. .. .	Apparatus for Generating Electric Currents .. .. .	8d.
4671	W. L. Scott .. .. .	Production, &c., of Electric and Electric Calcic Lights	6d.
4693	A. Reimenschneider and F. S. Christensen .. .. .	Apparatus for Dividing Electric Light.. .. .	4d.
4700	A. Miller .. .. .	Manufacture of Illuminating Gas .. .. .	6d.
4705	F. J. Cheeseborough.. .. .	Distributing Electric Currents for Lighting, &c. .. .. .	1s.
4847	Ditto .. .. .	Electric Lamps .. .. .	8d.
4737	A. Cahen .. .. .	Manufacture of Salts of Soda .. .. .	6d.
4762			
4774	L. L. Pulvermacher .. .. .	Producing Light by Electricity .. .. .	6d.
4844	Ditto .. .. .	Dynamo Electric Machine for producing Electric Currents .. .. .	6d.
4812	F. W. Vogel .. .. .	Machinery for Generating Electricity .. .. .	2d.
4813	G. Scarlett and C. Hayward .. .. .	Electric Magnetic Engines .. .. .	2d.
4821	R. Sabine .. .. .	Electric Lamps or Regulators .. .. .	2d.
4862	A. Ashby .. .. .	Softening Water .. .. .	4d.
4955	E. Johnson and L. Robertson .. .. .	Apparatus for Generating Chlorine Gas .. .. .	2d.
4960	A. V. Newton.. .. .	Apparatus for producing Electric Light .. .. .	10d.
4988	S. P. and W. P. Thompson.. .. .	Production of Electric Light .. .. .	2d.
5011	S. Cohné .. .. .	Electric Candle .. .. .	2d.
5044	J. H. Johnson .. .. .	Electric Lamps .. .. .	2d.
5053	Ditto .. .. .	Apparatus for Lighting by Electricity .. .. .	2d.
5057	C. D. Abel .. .. .	Manufacture of Pyroxyline .. .. .	6d.
5152	G. Whyte .. .. .	Electric Lamps or Lights .. .. .	6d.
5159	R. V. Tuson .. .. .	Preparation of Sulphurous Acid Gas .. .. .	2d.
5165	A. M. Clark .. .. .	Electric Lamps .. .. .	4d.
5183	W. R. Lake .. .. .	Electric Lighting Apparatus .. .. .	8d.
5197	H. Wilde .. .. .	Ditto ditto .. .. .	2d.

### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Boston Journal of Chemistry; The Provisioner; The American Dairyman; The Practitioner; American New Remedies; Proceedings of the American Chemical Society; Le Praticien; The Inventors' Record; New York Public Health; Philadelphia Printers' Circular; Annual Announcement of the Faculty of Medicine of McGill University, Montreal; Annual Report of the Smithsonian Institution, New York; Ammonia Liquor Tests, by F. W. Hartley.

# THE ANALYST.

SEPTEMBER, 1879.

## SOCIETY OF PUBLIC ANALYSTS.

A GENERAL MEETING of this Society was held on the 22nd August, at the Literary and Philosophical Society, Sheffield, Mr. G. Jarman in the chair.

The minutes of the previous meeting were read and confirmed.

On the ballot papers being opened it was announced that Mr. W. F. H. Pocock, Analytical Chemist of Cape Town, Cape of Good Hope, had been elected a Member.

The following papers were then read:—

“A Suggestion Respecting the Expression of the Results of Butter Assays by Dr. Koettstorfer’s Method,” by A. H. Allen, F.C.S.

“The Relation Between Dr. Koettstorfer’s Process of Butter Analysis and the Old Processes,” by G. W. Wigner, F.C.S.\*

“Note on the Quality of the Paper Employed by the Daily Press,” by A. H. Allen, F.C.S.

“On the Difference in Milk Between the Beginning and End of a Delivery,” by J. Carter Bell, F.C.S.

## NOTE ON THE QUALITY OF THE PAPER EMPLOYED BY THE DAILY PRESS.

BY ALFRED H. ALLEN, F.C.S.

*Read before the Society of Public Analysts, at Sheffield, on 22nd August, 1879.*

SOME two years since I had occasion to inquire into the quality of the paper supplied to a well-known daily paper, and I then incidentally examined the paper employed for various prominent newspapers, with the aim of ascertaining whether the paper in question was better or worse than the generality.

The plan of inquiry adopted was a very simple one. A strip of paper one inch wide and twelve inches long was cut from the edge of the newspaper. It was then well dried in a water-oven, and its weight taken. This was calculated to the square foot of paper. The strip of paper was then burnt, and the ash weighed. This weight was calculated to a percentage of the weight of the original strip.

The following table shows the results yielded by the leading daily papers. The papers are arranged in the order of their quality, as measured by the weight of the paper less that of the ash. This plan gives an approximation to the amount of the fibre, but of course the results are nothing more than rough comparisons as the quality of the paper is liable to accidental variation from several causes.

\* We are compelled to hold over this paper until our next number.—EDS. ANALYST.

Name of Paper.	Weight of Paper in grains per square foot.		Percentage of Ash.
	Total Weight.	Exclusive of Ash.	
1. Morning Post .. ..	110.4	104.1	5.7
2. Times .. ..	90.5	77.7	14.1
3. Pall Mall Gazette .. ..	94.2	76.8	18.4
4. Birmingham Daily Post .. ..	82.2	75.1	8.6
5. Daily Telegraph .. ..	71.1	66.5	6.4
6. Plymouth Post .. ..	68.8	65.2	5.4
7. Sheffield Daily Telegraph.. ..	71.3	63.0	11.5
8. Bristol Daily Post.. ..	67.7	62.5	7.6
9. Daily News .. ..	67.7	61.0	10.0
10. Western Morning News .. ..	68.7	61.0	11.4
11. Standard .. ..	71.1	60.2	15.3
12. Globe .. ..	69.8	59.1	14.2
13. York Herald .. ..	65.5	58.5	10.8
14. Manchester Guardian .. ..	64.1	58.2	9.2
15. Leeds Mercury .. ..	63.7	57.3	10.1
16. Manchester Examiner .. ..	67.7	56.4	12.9
17. Liverpool Daily Post .. ..	59.3	56.2	5.1
18. Echo .. ..	68.7	56.0	18.3
19. Yorkshire Post .. ..	64.2	54.4	15.4
20. Liverpool Mercury.. ..	60.8	53.3	12.3
21. Sheffield Independent .. ..	62.5	51.7	17.4
22. Western Daily Press .. ..	58.3	50.1	14.0

These results clearly show, as might have been expected, that the *Morning Post* and *Times* papers are heavier and stronger than those employed for the penny press. The difference between the ash of these two papers is, however, somewhat striking, and other curious points will occur to anyone inspecting the figures.

The weight and percentage of ash of paper furnish the usual commercial tests of quality, and although these factors are not the only ones which should be taken into account in forming an opinion, they are of considerable importance, and hence the figures recorded may be of service to chemists engaged on similar inquiries, as they show what newspaper should contain. Other things being equal, the paper will be better the greater its weight per square foot. The ash, of course, indicates so much mineral matter added to give weight, substance, and surface; and, as it does not add to the strength, it should be deducted before making a comparison of the quality.

The determinations recorded in the table were made in my laboratory by Mr. Charles Harrison.

I may add that the colouring matter which gives the *Globe* its roseate hue is aniline red. It may readily be dissolved out of the paper by alcohol.

#### A SUGGESTION RESPECTING THE EXPRESSION OF THE RESULTS OF BUTTER ASSAYS BY DR. KOETTSTORFER'S METHOD.

By A. H. ALLEN, F.C.S.

Read before the Society of Public Analysts, at Sheffield, on 22nd August, 1879.

I HAVE been much interested in perusing the description of Dr. Koettstorfer's method of detecting foreign fats in butter, and have no doubt that experience will prove it to be extremely useful. It appears to me, however, that his mode of stating the neutralizing power of the fats is very cumbrous, and has the disadvantage that if soda

be used for saponification instead of potash a different amount of it will be necessary, and hence the relation between the results obtained will not be directly evident. As the simplicity and accuracy of Dr. Koettstorfer's process are likely to bring it into very general use, I propose, that instead of stating the results in milligrammes of  $\text{KHO}$  used per gramme of fat, they should be expressed by figures representing the combining equivalent of the fats present. These will in each case be one-third of the molecular weights of the fat, owing to the triad character of the glycy radical.

Thus, 56.1 parts of  $\text{KHO}$  will theoretically saponify 296.7 parts of tri-stearin; 292.0 parts of tri-olein; 296.0 parts of tri-palmitin; or, 100.67 parts of tri-butyryn.

Dr. Koettstorfer's results are capable of translation into equivalents, by dividing the milligrammes of  $\text{KHO}$  employed into the number 56.1.

By so doing, we find that the average equivalent weights of the animal fats tested by Dr. Koettstorfer were as follows:—

Beef dripping .. .. .	285.5
Commercial tallow .. .. .	285.1
Lard from kidneys .. .. .	286.5
Lard from unsmoked bacon .. .. .	286.7
Commercial lard .. .. .	287.1
Mutton dripping .. .. .	284.8
Average =	<u>286</u>

Calculating in the same manner, his results show 292.5 as the equivalent of olive oil, and 313.9 as that of colza oil.\*

On the other hand, the equivalents of the thirteen samples of butter varied from 253.3 to 241.4, the average being 247.1.

Hence, average butter fat has an equivalent lower by 39 than the average of animal fats. Dividing this difference by 100, we find that every rise of .39 in the equivalent of the sample represents 1 per cent. of *probable* adulteration; but, of course, though these figures may be properly used for calculating the probable proportion of admixture, a butter should not be condemned unless its equivalent be found to exceed 255.

By expressing the results of analysis in equivalents, it is evident that it becomes a matter of indifference whether soda or potash be used for saponification. It will be noticed that the expression in equivalent weight is at once obtained by dividing 1.000 by the number of c.c. of normal alkali required to saponify one gramme of the fat under examination.

## ON THE DIFFERENCE IN MILK BETWEEN THE BEGINNING AND END OF A DELIVERY.

By J. CARTER BELL, F.C.S.

*Read before the Society of Public Analysts, at Sheffield, on 22nd August, 1879.*

It has been stated to me by milkmen and others, that the last few pints of milk from a can which has been carried about in a cart are not so good as the milk before it begins its journey. This absurd statement has on more than one occasion been made before the magistrates, who are rather inclined to believe the story. Having just had an

\* The high equivalent of colza oil, if confirmed by further experiments, points to the presence of a higher homologue of stearic or oleic acid in this product.

adulterated sample of milk, the usual excuse was put forward: "Last in the can."

To settle this point, I asked the Inspector to travel with the cart, and to take a sample on starting, another in the middle of the journey, and a third at the end. It will be seen by the analyses that practically speaking there is no difference.

No. 1. Taken at 5.30 p.m., commencement of journey—

Total solids, by weight	..	..	..	..	..	..	..	..	..	12.49
Solids not fat	..	..	..	..	..	..	..	..	..	8.94
Fat	..	..	..	..	..	..	..	..	..	3.55
Ash	..	..	..	..	..	..	..	..	..	.73

No. 2. Taken at 7 p.m.—

Total solids	..	..	..	..	..	..	..	..	..	12.56
Solids not fat	..	..	..	..	..	..	..	..	..	9.02
Fat	..	..	..	..	..	..	..	..	..	3.54
Ash	..	..	..	..	..	..	..	..	..	.73

No. 3. Taken from last in can, 8.30 p.m.—

Total solids	..	..	..	..	..	..	..	..	..	12.57
Solids not fat	..	..	..	..	..	..	..	..	..	8.98
Fat	..	..	..	..	..	..	..	..	..	3.59
Ash	..	..	..	..	..	..	..	..	..	.70

### SALE OF FOOD AND DRUGS ACT AMENDMENT ACT, 1879.

THE following is the full text of this Act, to which the Royal Assent was given on the 21st July last, and which we presume came into operation at once:—

WHEREAS conflicting decisions have been given in England and in Scotland in regard to the meaning and effect of section six of the Sale of Food and Drugs Act, 1875, in this Act referred to as the principal Act, and it is expedient, in this respect and otherwise, to amend the said Act: Be it enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

1. This Act may be cited for all purposes as the Sale of Food and Drugs Act Short title. Amendment Act, 1879.

2. In any prosecution under the provisions of the principal Act for selling to the purchaser any article of food or any drug which is not of the nature, substance, and quality of the article demanded by such purchaser, it shall be no defence to any such prosecution to allege that the purchaser, having bought only for analysis, was not prejudiced by such sale. Neither shall it be a good defence to prove that the article of food or drug in question, though defective in nature or in substance or in quality, was not defective in all three respects.

3. Any medical officer of health, inspector of nuisances, or inspector of weights and measures, or any inspector of a market, or any police constable under the direction and at the cost of the local authority appointing such officer, inspector, or constable, or charged with the execution of this Act, may procure at the place of delivery any sample of any milk in course of delivery to the purchaser or consignee in pursuance of any contract for the sale to such purchaser or consignee of such milk; and such officer, inspector, or constable, if he suspect the same to have been sold contrary to any of the provisions of the principal Act, shall submit the same to be analysed, and the same shall be analysed, and proceedings shall be taken, and penalties on conviction be enforced in like manner in all respects as if such officer, inspector, or constable had purchased the same from the seller or consignor under section thirteen of the principal Act.

4. The seller or consignor or any person or persons entrusted by him for the time being with the charge of such milk, if he shall refuse to allow such officer, inspector, or constable to take the quantity which such officer, inspector, or constable shall require for the purpose of analysis, shall be liable to a penalty not exceeding ten pounds.

38 & 39 Vict.  
c. 63.

In sale of adulterated articles no defence to allege purchase for analysis.

Officer, inspector, or constable may obtain a sample of milk at the place of delivery to submit to analyst.

Penalty for refusal to give milk for analysis.



5. Any street or open place of public resort shall be held to come within the meaning of section seventeen of the principal Act. Extension of Act as to sale in streets, &c.
6. In determining whether an offence has been committed under section six of the said Act by selling, to the prejudice of the purchaser, spirits not adulterated otherwise than by the admixture of water, it shall be a good defence to prove that such admixture has not reduced the spirit more than twenty-five degrees under proof for brandy, whisky, or rum, or thirty-five degrees under proof for gin. Reduction allowed to the extent of 25 degrees under proof for brandy, whisky, or rum, and 35 degrees for gin.
7. Every liberty having a separate court of quarter sessions, except a liberty of a cinque port, shall be deemed to be a county within the meaning of the said Act. Extension of meaning of "county."
8. The town council of any borough having a separate court of quarter sessions shall be exempt from contributing towards the expenses incurred in the execution of the principal Act in respect of the county within which such borough is situate, and the treasurer of the county shall exclude the expenses so incurred from the account required by section one hundred and seventeen of the Municipal Corporation Act, 1835, to be sent by him to such town council. Quarter sessions boroughs not to contribute to county analyst. 5 & 6 W. 4. c. 76.
9. The town council of any borough having under any general or local Act of Parliament, or otherwise, a separate police establishment, and being liable to be assessed to the county rate of the county within which the borough is situate, shall be paid by the justices of such county the proportionate amount contributed towards the expenses incurred by the county in the execution of the principal Act by the several parishes and parts of parishes within such borough in respect of the rateable value of the property assessable therein, as ascertained by the valuation lists for the time being in force. Provision for boroughs with separate police.
- 10.—In all prosecutions under the principal Act, and notwithstanding the provisions of section twenty of the said Act, the summons to appear before the magistrates shall be served upon the person charged with violating the provisions of the said Act within a reasonable time, and in the case of a perishable article not exceeding twenty-eight days from the time of the purchase from such person for test purposes of the food or drug, for the sale of which in contravention to the terms of the principal Act the seller is rendered liable to prosecution, and particulars of the offence or offences against the said Act of which the seller is accused, and also the name of the prosecutor, shall be stated on the summons, and the summons shall not be made returnable in a less time than seven days from the day it is served upon the person summoned. Special provision as to time for proceedings.

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## THE LOCAL GOVERNMENT BOARD AND THE SALE OF FOOD AND DRUGS ACT, 1875.

The Local Government Board have just issued their Annual Report for 1878, and from it we extract the following:—

“In our last report we stated that we had addressed communications to all those authorities from whom we had not received any intimation of an analyst having been appointed, calling attention to the provisions of The Sale of Food and Drugs Act, 1875, and requesting that, if an analyst had not been appointed under it, or under any of the statutes which it repealed, the subject might receive early consideration. The result of these communications, has, so far, been satisfactory, for whereas in the year 1877 analysts were appointed, under section 10, in twenty-seven additional cases, during the year ended the 31st of December last forty-three additional appointments were reported to and approved of by us. Three authorities also availed themselves of the provisions of section 11, and entered into agreements with the County Analyst, or with the analysts for neighbouring boroughs, to act in a similar capacity for their boroughs.

“Up to the above-mentioned date the number of authorities who had appointed

analysts under section 10, with our approval, the appointments being then in existence, is as follows :—

Counties .. .. .	49
Boroughs .. .. .	108
District Boards and Vestries in the Metropolis .. .. .	39
	<hr/>
	196
Agreements entered into under section 11 .. .. .	5
	<hr/>
	201
	<hr/>

“ We are still in communication with those authorities who have not yet availed themselves of the advantages to be derived from the appointment of an analyst.

“ The experience of previous years had suggested the advisability of an attempt being made to secure proximate uniformity in the quarterly reports required to be made by Public Analysts to local authorities under the 19th section of the Act, and in January we issued to authorities the circular” printed in the appendix to the report.

[This circular encloses the form of report which analysts now use.—Eds. ANALYST.]

“ The result has been greatly to facilitate the preparation of the abstract of these reports.

“ We find that in 1878, as previously, only a small proportion of the analyses were made at the instance of private individuals, and that in many districts all the samples analysed had been procured by inspectors appointed under section 13 of the Act.

“ On several occasions in previous years it had been contended before magistrates that an official purchaser, buying not for his own consumption but exclusively for analysis, and on behalf of the authority, could not be ‘ prejudiced ’ within the meaning of section 6 of the Act. This objection, however, had not generally been held valid by English magistrates, and the suggested difficulty in respect of such purchases did not arise until attention was called to a decision of the High Court of Justiciary in Scotland from which it was inferred that the terms of the 6th section might be so interpreted as practically to nullify the operation of the Act. Some remarks attributed to one of the judges of High Court of Justice in the case of *Sandys v. Small* (which, however, do not appear in the authorised report of the case L.R. 3 Q.B.D. 449), gave further colour to this assumption, and the result was that, pending an appeal on this point to the High Court at Westminster, comparatively few samples were submitted for analysis in the latter part of 1878, and even in the cases in which samples were analysed and found to be extensively adulterated, local authorities hesitated to take legal proceedings against the vendors. We regret that interruption in the working of an useful Act should have been caused by any uncertainty as to the meaning of a provision which was inserted for the special purpose of preventing a tradesman from being convicted for selling, to his own disadvantage, an article superior to that demanded.

“ It is satisfactory, however, to find that notwithstanding a marked falling off at the end of the year, due to the cause we have indicated, the entire number of samples submitted for analysis in 1878, exceeds by more than 200 those analysed in the previous twelvemonth, and that the proportion of adulterated samples shows a substantial diminution.

“The first comprehensive enquiry into the prevalence of adulteration in England was that of the *Lancet* Commission in 1854-56, when considerably more than half the samples analysed were reported against. In the year 1877, when the results of the analysis under the Act of 1875, were for the first time tabulated, the proportion of adulterated samples was 19·2. In 1878 it was 17·2; and it may be further noticed that if spirits are excluded from the calculation the percentage of adulteration falls from 15·5 in 1877, to 13·7 in 1878.

“The following table shows the number of samples examined in the year, and the percentage of adulteration. It must be specially borne in mind that such percentage is based on the results of the analyses as given in the quarterly reports, and not merely upon the number of cases in which legal proceedings were instituted.

	Examined.	Adulterated	1877. Percentage of adultera- tion.	1878. Percentage of adultera- tion.
Milk .. .. .	4,923	1,065	24·1	21·6
Bread .. .. .	921	66	7·4	7·1
Flour .. .. .	600	11	6·0	1·8
Butter .. .. .	904	116	10·8	12·6
Coffee .. .. .	1,060	196	17·5	18·5
Sugar .. .. .	299	13	0·4	4·3
Mustard .. .. .	787	154	18·8	19·5
Pickles (including tinned Vegetables)	114	8	27·6	7·0
Jam .. .. .	51	1	6·1	1·9
Confectionery .. .. .	314	16	3·3	5·0
Wine .. .. .	76	2	32·2	2·6
Beer .. .. .	999	50	9·3	5·0
Gin .. .. .	918	432	57·7	47·0
Spirits other than Gin	791	365	47·6	46·1
Drugs .. .. .	491	125	21·8	25·4
Other Articles .. .. .	2,943	162	9·8	5·5
Total .. .. .	16,191	2,782	19·2	17·2

“It will be seen that, as compared with 1877, there has been a decided improvement in the quality of the milk analysed, though we cannot regard it as satisfactory that, even now, more than one-fifth of the samples examined fail to reach the standard of genuineness generally adopted by analysts. That standard is necessarily low, since the present state of science does not enable the analyst to pronounce with certainty whether excess of water, down to a certain limit, is due to natural poverty of milk, or to the dilution of milk which was originally good; and thus a higher standard of excellence cannot be set up without making it possible to secure convictions under an Adulteration Act for the sale of what is perhaps the milk of ill-fed cows, but is nevertheless perfectly genuine. It is worth remarking, however, that in some instances in which the result of the examination had been such as to lead to the inference that a small amount of water had been added, although the evidence was not strong enough to warrant the adoption of legal proceedings, the vendors were informed of the suspicion attaching to them and cautioned as to the future. In one case the vendor of extensively watered milk was excused from prosecution on pleading extreme poverty, and gratefully undertook to abandon the trade of dairyman altogether. It is to be feared, however,

that where, as is the case in some districts, the magistrates inflict only small fines, a good many milk-sellers find it profitable to pay the fines and continue adulteration.

“Of the bread examined it will be seen that about seven per cent. of the samples were reported against, for the most part in consequence of additions of alum by which it was sought to improve its appearance.

“Of the samples of flour, only 11 out of 600 had been similarly tampered with.

“The sale of a compound of foreign fats in place of butter seems to be somewhat on the increase. The Public Analyst for St. Giles District observes with regard to this article that ‘it is more palatable than common rancid butter;’ and though this amount of commendation does not suggest a high degree of attractiveness, yet, as he also states that the commodity is wholesome and nutritious, we see no reason against its use, provided it be invariably sold under a distinctive name and not fraudulently substituted for the genuine product of the churn.

“As regards coffee, the returns for 1878 show some increase of adulteration as compared with those for 1877. In the investigations made by the *Lancet* Commission, roasted corn, beans, and potato flour were found to be among the substances used to adulterate coffee, but it would appear that the employment of these substances has now been almost entirely abandoned, though mixtures of chicory and coffee are still extensively sold without due warning to the purchaser, and a new preparation of coffee mixed with roasted and ground datestones has been introduced. The practice as to the delivery of notifications of admixture, however, is by no means uniform in different parts of the country, and we remark that while in Liverpool 67 samples of so-called coffee out of 85 are found to contain chicory in greater or less proportion, the County Analyst of Gloucestershire only reports against two samples out of 71. Similarly, as regards mustard, it may be said that while some perfectly harmless and very palatable preparations of mustard are deservedly popular, they are too often sold without an intimation to the purchaser that they are compounds, and not merely mustard flour. Under the heads of pickles, jams, and confectionery respectively the returns show only a small amount of adulteration, and in very few instances was such adulteration of a character likely to be injurious to health. Of wine, only two samples out of 76 were reported against and it may be inferred that the sophistication of cheap wines is not so common as is popularly supposed. Of one of the adulterated samples in question the analyst observed that it was a ‘concoction resembling nothing in particular, and called sherry,’ the other was an entirely fictitious claret, coloured with magenta, and is described as ‘a most unwholesome beverage.’

“Of the samples of beer it will be seen that nearly five per cent. of the whole number of samples examined were reported against, although in the Metropolitan District all but six samples were genuine out of 237. Excess of salt is the ground on which most of the samples have been pronounced adulterated, and the use of noxious ingredients seems to be now nearly obsolete. With regard to the addition of salt, there is much difference of opinion as to whether the practice prevails to any considerable extent. It is alleged on the one hand that salt is added by publicans in order to make their beer provoke rather than slake thirst, but on the other hand it is affirmed that most consumers would be repelled at the onset by beer sufficiently salted to have that

effect. Moreover, very different estimates appear to be made of the amount of salt that may be naturally present in beer brewed from nothing but malt, hops, water, and perhaps sugar, and to which nothing has since been added. The Analyst for Lincolnshire states that the best brewing waters contain less than 15 grains of salt per gallon, and, allowing for the chlorides natural to the malt and hops used, he considers that beer should not have more than 20 to 25 grains of salt per gallon, and he adopts 30 grains per gallon as a standard which will leave sufficient margin. Similarly the Analyst for the County of Cardigan reports against samples containing from  $22\frac{1}{2}$  to 33 grains of salt per gallon. On the other hand the Analyst for the Strand District states that "one sample of Yarmouth ale contained 125 grains of salt per gallon, naturally present," and the Analyst for Windsor thinks it "scarcely advisable to institute proceedings unless the common salt exceeds 100 grains per gallon." The Analyst for the District of Saint Saviour, Southwark, reports that as much as 91 grains per gallon was found in the porter of a well-known London firm of brewers, and a summons was issued on the analyst's certificate. The firm, however, gave every facility for an examination of the materials used for brewing; and it was found that the water itself contained chlorides estimated as equivalent to 48 grains of common salt per gallon; and, considering that a gallon and a third of water is required to brew a gallon of beer, this would account for no less than 64 grains in respect of the water alone, without reckoning the not inconsiderable amount of chlorides in the malt, sugar, and hops employed. The result of this investigation was the withdrawal of the summons, as there was every reason to believe that the salt found in the porter had been derived from the legitimate ingredients used in brewing. No doubt the result of this and similar inquiries will tend to prevent analysts from assuming too hastily that the presence of an amount of salt rather above the average quantity necessarily implies that beer has been adulterated.

"Of the samples of spirits examined, it will be seen that nearly half are reported against, but it is necessary to explain that this result is due almost entirely to the practice of diluting spirits with water, and that there has been scarcely an instance of the addition of the pungent ingredients, such as capsicum and oil of vitriol, which used to be employed to stimulate strength in reduced spirits. Considerable difference of opinion, however, has existed as to the amount of dilution which should be allowed, and hence it has happened that a fine has been inflicted in one district for the sale of spirit which in another district would have been passed by the analyst as genuine. It is almost inevitable that some such difficulty should arise in the case of an article which is a compound of alcohol and water in very varying proportions. For instance, gin generally leaves the still at about 50 per cent. over proof, whereupon the rectifier flavours it, and adds water so as to bring it to about 17 per cent. under proof, at which strength, or some five degrees weaker, it is usually issued to the retailers who in their turn frequently make further additions of water. There is obviously some difficulty, in the absence of a generally recognised standard, in fixing the precise point at which a compound of alcohol and water ceases to be gin and becomes gin-and-water.

"Probably nobody could drink 'genuine' gin, if by that term is meant the spirit as it comes from the still, while if 'gin' be defined as the spirit originally sold under

that name, it must be admitted that there has for a long time existed a general practice of selling, as gin, a very weak spirit at a correspondingly low price. It seems to us that there is much need of a settlement of this question by the establishment of a standard, either fixed by general agreement (if that be attainable) or by legal enactment. So long as one analyst reports gin 24 per cent. under proof as adulterated, while another reports gin 38 per cent. under proof as genuine, there will be complaints, not altogether unfounded, of the hardship caused by such anomalies.

“ We have again to express regret that more samples of drugs are not submitted to analysis, for it is obvious that prescriptions may have very different effects according as they are made up with genuine or with adulterated medicines.

“ An illustration of this is afforded by the report of the Analyst for the West Riding of Yorkshire, who observes that ‘ the dilution of sweet spirit of nitre by addition of water causes a gradual decomposition of the nitrous ether on which its medicinal value depends, thus rendering it worthless; hence the dilution of sweet spirit of nitre cannot be too strongly condemned.’

“ We find that a good many of the samples examined were of violet powder, public attention having been drawn to this article by the disastrous results arising at Loughton from the use of such powder which had become mixed with large quantities of arsenic. No similar admixture was discovered elsewhere, but in several instances substances which would act as irritants rather than as sedatives were sold under the name of violet powder.

“ Of the articles not specified by name in the table given above, cocoa furnishes a considerable proportion, and the Analyst for Hackney reports that some of the samples, which it is true had been labelled as mixtures, contained only from ten to fifteen per cent. of cocoa, and should have been rather described as ‘ arrowroot flavoured with sugar and cocoa.’ He adds that this compound is comparatively useless as a food, for the quantity used for making a cup of cocoa would scarcely have greater nutritive value than a single mouthful of bread and butter. In the same district, as well as in that of Clerkenwell, occasion was taken to analyse some of the ices sold by itinerant vendors, and it is satisfactory to learn that in no case was any injurious ingredient detected.

“ Summing up the evidence of the reports as a whole, we may observe that they afford proof that while the growing demand for excessive cheapness has a tendency to produce spurious imitations, yet, speaking generally, adulteration is diminishing; its character, where it exists, is much less noxious than formerly; and by the help of the Act it is possible for persons who take reasonable precautions to obtain only genuine articles of consumption.”

The Customs Analysts report to the Commissioners that during 1878 they received 639 samples of tea for analysis, and of these 47 were reported to the Board as being either bad or doubtful. Seven of these were ordered to be detained as seizures, but on re-consideration 3 of them were allowed to be exported, and only the remaining 4, which represented 6 packages, were destroyed as unfit for food. Inclusive of the 3 above mentioned, a total of 19, representing 5,372 packages, were allowed to be exported—that is, we presume, were considered unfit to be consumed in England—and the remaining 24, representing 5,948 packages, were admitted for consumption. The number

reported to the Board is only about half what it was for 1877, viz., 88, and this diminution is rightly considered to indicate that some check has been put upon tea adulteration. The principal if not only adulterant used during both 1877 and 1878 was exhausted tea leaves.

The following is a list of the total number of samples, examined and adulterated, in England and Wales, during 1878:—

TOTAL NUMBER OF SAMPLES.

	Examined.	Adulterated.	Proportion	Adulterated.
			1878.	1877.
The Metropolitan District .. ..	4642	589	12·6	13·4
COUNTIES.				
Bedford .. ..	206	16	7·7	7·4
Berks .. ..	61	5	8·1	5·1
Bucks .. ..	4	0	0·0	0·0
Cambridge .. ..	31	8	25·8	22·7
Chester .. ..	551	154	27·9	20·6
Cornwall .. ..	15	4	26·6	39·3
Cumberland .. ..	48	30	62·5	—
Derby .. ..	109	23	21·1	31·3
Devon .. ..	74	10	13·5	28·6
Durham .. ..	510	85	16·6	31·0
Essex .. ..	7	5	71·4	57·1
Gloucester .. ..	725	57	7·8	8·2
Herts .. ..	41	6	14·6	—
Kent .. ..	289	38	13·1	0·0
Lancaster .. ..	1868	462	24·7	26·8
Leicester .. ..	278	31	11·1	18·8
Lincoln .. ..	369	98	26·5	32·7
Middlesex .. ..	147	34	23·1	12·4
Monmouth .. ..	74	25	33·7	—
Norfolk .. ..	12	4	33·3	23·2
Northampton .. ..	133	28	21·0	14·9
Northumberland .. ..	319	103	33·8	38·4
Nottingham .. ..	72	14	19·4	17·5
Oxford .. ..	15	7	46·2	72·7
Rutland .. ..	8	0	0·0	0·0
Shropshire .. ..	164	29	17·6	15·6
Somerset .. ..	1169	129	11·0	13·7
Southampton .. ..	438	115	26·2	21·4
Stafford .. ..	962	153	15·9	22·6
Surrey .. ..	535	120	22·4	12·9
Sussex .. ..	319	47	14·7	17·7
Warwick .. ..	252	57	22·6	25·4
Westmoreland .. ..	37	17	45·9	—
Wilts .. ..	84	13	15·4	—
Worcester .. ..	149	24	16·1	29·5
York, E. Riding .. ..	183	40	21·8	—
"    N. Riding .. ..	56	10	17·9	42·2
"    W. Riding .. ..	668	113	16·9	22·0
WALES.				
Anglesey .. ..	27	2	7·4	—
Cardigan .. ..	34	11	32·3	—
Carmarthen .. ..	64	18	28·1	51·2
Glamorgan .. ..	442	43	9·7	20·6
Pembroke .. ..	—	—	—	12·5
<b>TOTALS</b>	<b>16,191</b>	<b>2782</b>	<b>17·18</b>	<b>19·2</b>

## REVIEWS.

*Spon's Encyclopadia of the Industrial Arts, Manufactures, and Commercial Products.*

Edited by G. G. ANDRÉ, F.G.S.

THE first division of this work (which is published in numbers of 64 pages each at 2s.) is now complete. It contains 384 pages, carries the subject matter down to "Beverages," and is issued in a cloth-bound volume of handy size, which is not too thick and heavy for common use. In the initial notice of the book we were reminded that the great strides lately taken by chemistry had rendered previous works on the same lines comparatively obsolete; but in addition to this claim to attention the promised *Encyclopadia* was to have a still stronger *raison d'être*, from the fact that in treating the various subjects the *ultra scientific* and the *popular* styles were both to be discarded in favour of a strictly practical or manufacturing point of view. That this promise has been well carried out must be fully admitted, and, if the *status* of the present volume be maintained in its successors, we shall have in *Spon's Encyclopadia* a real addition to our standard practical literature. The division now complete commences with the acids, and includes alcohols, alkalis, alloys, alum, arsenic, asphalt, assaying, beer, and beverages generally. The most copious and practical details are given of the manufacture of the substances treated of, while the illustrations of the necessary apparatus and plant are exceedingly copious and well drawn. The various articles are stated to have been written by men actually engaged in the respective manufactures, and they certainly read as if this were so, because, not only do they discuss all the methods at present in use, but also indicate carefully the weak points of each process, and show where further improvements are still desirable. The portion on alcohol and the various improved methods for its rectification, is very interesting, and the details of gin and whisky manufacture somewhat startling to a general reader. Here, for instance, is a complete answer to the complaints of an undeserving public, that in spite of Public Analysts adulterated gin is constantly sold, as it seems that the true art of gin-making is in itself the very *acmé* of adulteration. At page 222 we read that "gin was originally imported from Holland under the name of 'Geneva,' from *Genievre*, the French for juniper. The liquor known by this name in England, or British gin, is a very different article from that made in Holland. It consists solely of grain spirit, flavoured with *oil of turpentine* instead of juniper. Small quantities of other aromatic substances are introduced into the spirit for the purpose of hiding or 'killing' the very unpleasant taste and effects of the unrectified grain spirit. The recipes which are given in different works for the preparation of gin are wholly untrustworthy, as they yield a liquor which bears but little resemblance to true gin. Indeed, all attempts to make gin from the recipes usually found in books have invariably resulted in failure. Each distiller has his own particular recipe, and his product its own characteristic flavour and adherents; the difference between the several varieties, and especially between those of London and Plymouth, is very marked. In making gin, great care must be taken not to use an excess of flavouring. The following are good recipes for British gin:—

"(1.) Grain spirit (proof), 80 gallons; newly rectified oil of turpentine, 1½ pint; mix well together: add 14 lbs. of common salt dissolved in 40 gallons of water; stir



well and add 8 fluid drachms of creasote : distil over 100 gallons, or until the feints begin to rise. The product is 100 gallons of gin, 22 u.p. Half-a-pint of either rectified fusel oil or of oil of juniper may be added."

Passing over two other recipes, we come to a final one, in which among other interesting ingredients we find oil of vitriol and chilies, alum and cream of tartar being added at the last to fine. Such being the real practical receipts for gin-making, where is the bold analyst who can find any adulteration ?

Perhaps the weakest point in the volume is the article on assaying, but as the writer has been limited apparently to 15 pages, in which he not only goes over all the metals, but also takes in coal, guano, gunpowder, limestone, and nitre, it is not to be expected that the matter can be carried beyond mere notes, coupled with details here and there of what the author considers to be good processes. The article would have been much increased in value if mention had been made of special works to which the reader might have been referred for fuller instructions. Viewed as a mere summary, it is well and crisply put together, but it is out of accordance with the full information given on other subjects, and it is almost a pity that a mere sketch, as it were, of chemical analysis should have been introduced at all, as very few who buy the book will require information of this kind. Taken, however, as a whole, *Spon's Encyclopaedia* must be held to be a thoroughly useful work, without which no manufacturer's library will be complete, and which no student of chemistry intending to enter the manufacturing branch can afford to neglect. As a book of reference for the consulting chemist it will also have a useful place in all questions relating to works, and the more so that copies of all statutes (such as the Alkali Act) affecting any particular process will be found in their proper places.

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*A Systematic Course of Practical Qualitative Analysis.*

By THOMAS ELTOFT, F.C.S.

THIS is another of these books of limited scope, designed for students preparing for special examinations. It has no feature of novelty, except that the usual tabular form has been departed from in the metal course, and a system of printing followed which the author specially points to in the preface ; but, strangely enough, the very thing thus abandoned in the metals is adopted for the acids ! The author fancies that his is " the first attempt to place the acids in systematic order and small space," but, before taking up that idea, he should have diligently searched the larger works, and he would have found that practically the same system has already been used in a more extended form. In *Muter's Analytical Chemistry*, for example, the acids are reduced to an exact course, just like the bases, by a similar " preparation of solution" and succession of re-agents to those employed in this *brochure*, but in that work many organic acids are also included, which are, of course, absent here.

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**ADULTERATED DRUGS.**—Dr. Cameron, Analyst for the County of Limerick, having recently reported to the Guardians of Newcastle Union that five out of seven drugs sent to him were adulterated, the Board resolved that in future all the drugs supplied to the Union should be submitted to analysis, and if adulterated the vendors prosecuted.

## LAW REPORTS.

**ADULTERATED SWEET SPIRITS OF NITRE.**—At the Leeds Town Hall, W. Greenwood, of Commercial Road, Kirkstall, was summoned by the Corporation for selling adulterated sweet spirits of nitre. It appeared that Inspector Handford went to the defendant's shop and asked for 6 ozs. of sweet spirits of nitre, for which he paid 1s. 6d., and he told the defendant he purchased it for the purpose of having it analysed by the Public Analyst. The Public Analyst (Mr. Fairley) stated that the medicinal value of the liquid depended chiefly on the quantity of nitrous ether it contained, and that the sample submitted to him contained scarcely any of that element. The defendant said he bought the spirit of nitre, as it was, from two chemists in the town. He was fined 20s. and costs.

**REFUSING TO SELL IN THE STREET.**—At Lambeth Police Court, a milkvender, resident at Peckham, was summoned for refusing to serve Inspector Stevenson, a properly authorised officer. The defence was, that inasmuch as the defendant was hawking milk in the street, he could not be indicted, the Act of 1875 applying only to things "exposed for sale in a shop, premises, or stores." The objection was held to be fatal, but a case for a higher court was granted.

**ADULTERATING BEER WITH SALT.**—At the Worcester Police Court, Geo. Y. Houghton, landlord of the "Market Fountain Inn," was charged with having, on June 18th, sold ale adulterated with salt. Mr. Blakeway (of the Town Clerk's office) appeared to prosecute; Mr. Tree defended. Mr. Higgs, inspector, said that he asked the defendant for two quarts of home-brewed fresh ale. The ale was bottled and sealed. Dr. Swete had certified that it contained 98 grains of salt per gallon. On the previous day witness obtained a sample of water from the defendant's well. In cross-examination witness said that he had known the defendant for many years, and had known nothing against him or the beer he sold. Mr. Tree said that there was no evidence that anybody had found fault with the defendant's beer. He reminded the Bench that a grain of salt was the 480th part of an ounce; and as there were sixteen half-pints in a gallon, the quantity of salt which the defendant was charged with having in the beer analysed, 98 grains per gallon, was very small in an ordinary glass of ale. [Mr. Tree produced an envelope, showing the quantity of salt which there would be in half a pint of ale, at the rate of 98 grains per gallon]. Such a small quantity of salt could not be injurious to anybody. Instructions were issued by the Excise authorities, stating what articles were not to be put in beer, and not a word was said about salt. Salt in small quantities preserved beer. A certificate by Dr. Swete was put in, stating that beer brewed from the water which had been pumped from the defendant's well would not contain more than 25 grains of salt. Dr. Swete was examined, and said that he had analysed the water from the defendant's well, and found that it contained  $10\frac{1}{2}$  grains of salt per gallon. In cross-examination, Dr. Swete said that from 70 to 75 grains per gallon had been put into the beer. The beer was not home-brewed fresh beer. Any beer containing more than 70 grains per gallon had a salt taste. The natural taste of beer was not salt. In re-examination Dr. Swete said that he did not think salt was usually put into beer. He believed that the large brewers said that they did not put any salt into ale. If he were to drink half-a-pint of beer containing salt at the rate of 98 grains per gallon he should be thirsty and should want another glass. Unfortunately the Excise authorities allowed substitutes for malt and hops. The defendant was then called, and said that he had been eight years at the "Market Fountain." Since Mr. Higgs called, he had brewed ale with other water than that of his well, and his customers told him the ale was not so palatable. He had been in the habit of putting a farthing's worth of salt in 115 gallons of ale. The person who instructed him in the art of brewing told him to put in this quantity of salt. He put it in to make the beer keep and to make it palatable. Mr. Tree said that in the future the defendant would not put any salt into his beer. Defendant was fined 10s. and 50s. costs.

**PROSECUTION BY THE METROPOLITAN DAIRYMEN'S SOCIETY.**—Thomas Rose, of Beach Farm, Binfield, Berks, was summoned by the Metropolitan Dairymen's Society for selling to Mr. Barham, of the Express County Milk Company, a churn of milk adulterated to the extent of 15 per cent. of added water. Mr. Ricketts prosecuted, and Mr. Lickford appeared for the defendant. This case had been adjourned from the 28th of July, in consequence of the defendant having raised sundry objections to the form of the certificate, and also questioned the accuracy of the analysis. It appeared that Mr. Barham contracted with the defendant for a supply of pure milk to be delivered at Waterloo Terminus, but as it was found to be adulterated, complaints were made to the defendant, and on the 21st of June a churn of milk was watched from the defendant's farm to the Waterloo Station, where Mr. Parish, the Inspector of the Metropolitan Dairymen's Society, took samples, one of which he detained, one he took to Dr. Muter, and the third was handed to defendant. Dr. Muter's certificate showed that it was adulterated with 15 per cent. of added water. The defendant disputed Dr. Muter's certificate, and a

sample was sent, at the request of Mr. Ricketts, to Somerset House, to be analysed by the Government Analyst, and his certificate, dated a fortnight afterwards, set forth that the milk was adulterated to the extent of *not less than* 10 per cent. Dr. Muter, who was in attendance, said that the analysis coincided with his own, as the milk at the time would have turned sour, which caused it to be much lower, and an allowance had to be made for this decomposition which was not always certain. The actual figures were practically the same as his own. He had analysed the defendant's milk several times, and found it to be adulterated. The defendant was called, and he denied adding any water or anything else to the milk. He took a sample to the Public Analyst at Reading, and produced his certificate showing that it was pure milk. In cross-examination by Mr. Ricketts, he said he was fined at this Court in February, 1878, for sending up milk adulterated with water. After a lengthy examination and cross-examination of the inspector on sundry technical points, Mr. Slade said that it was his intention to decide in favour of the complainant. If the defendant wished to appeal on those points raised by his solicitor he could do so; and as the sample was not very heavily adulterated he should fine him £5 and £2 12s. 6d. costs.

"BUTTERINE."—At Kensington Petty Sessions, William Nash, dairyman and butterman, 46, Golborne Road, Notting Hill, was summoned by the Kensington Vestry for selling adulterated butter. Thomas Gayland, the inspector under the Food Adulteration Acts, sent a lad into defendant's shop for half-a-pound of 1s. butter, which on being analysed, was found to contain 70 per cent. of foreign fat. Defendant said he bought it as "butterine" or "bosh," and sold it at 1s. a pound without putting any name to it either as butter or anything else. The Bench fined him £2.

"BUTTERINE."—Before the Hyde Magistrates, John Miller, grocer, of Hyde, was charged by Superintendent Cooper with having sold to the prejudice of the purchaser one pound of butter, which was not of the nature, quality, and substance of the article demanded. The case for the prosecution was that, on the 8th of July, two constables saw in defendant's shop window a quantity of what was apparently butter, bearing a label "Millers, butter importers, 7d." They entered the shop and asked to be supplied with "a pound of that butter marked 7d." which was given to them. They told the shopman that it was purchased for the purpose of analysis. On being submitted to the County Analyst, Mr. Carter Bell, of Manchester, it was certified to be adulterated with 36 per cent. of foreign fat. The case for the defence was that the article was not sold as butter, but as "butterine," and that the officers on entering the shop asked to be supplied not with a pound of butter, but with a pound of "that" (pointing to the article which was ticketed 7d.), and that therefore the sale was perfectly legal. The case turned upon whether the article was sold as butter or butterine; the Bench took the former view, and imposed a fine of £5 and costs. Notice of appeal was given.

BUTTER AND "BUTTERINE."—At the Salford Police Court, before Mr. J. Makinson, Wm. Rawlinson, grocer, 316, Regent Road, was summoned for selling "butterine" for butter. The Town Clerk (Mr. C. Moorhouse) prosecuted, and Mr. Edge, barrister, appeared for the defendant. Mr. C. E. Thompson, inspector under the Sale of Food and Drugs Act, said that on the 11th July he went to the defendant's shop and asked for 1 lb. of butter, for which he paid 10d. He told the defendant he had purchased the butter for the purpose of having it analysed. The defendant replied, "Well I bought it as butter, and I expect it is butter." Witness handed over to the Public Analyst a sample of the butter. Mr. J. Carter Bell, Public Analyst, said he had analysed the "butter" purchased at the defendant's shop, and found it contained 85 per cent. of foreign fat. It was what was known as "butterine." Cross-examined by Mr. Edge, witness said he should prefer butter to butterine as an article of food. He concurred generally in the opinion of the Manchester City Analyst (Mr. Estcourt) that the introduction of butterine was a boon to the working classes, and that it was preferable to a good deal of the salt butter sold. Mr. Edge said the defendant's shopman in labelling the butter had made a mistake, and marked it 10d. instead of 8d. per lb. The defendant really believed that he was selling Irish butter to the inspector, and therefore he (Mr. Edge) contended that defendant was not liable to a penalty. The section of the Act under which the defendant was summoned, stated that a penalty might be inflicted where a person sold to the prejudice of the purchaser something which was not of the nature and quality of the article demanded. To bring the present case within the meaning of the statute there must be an intention to defraud by the defendant. There was no such intention, as the evidence of the inspector proved, on the part of Mr. Rawlinson, as there was a *bona fide* belief in his mind that it was butter which the inspector had purchased. The Town Clerk said it was unnecessary to prove any fraudulent intention; the question was whether the defendant sold an article of the nature and quality of the article demanded. If the defendant had been defrauded by his merchant in having palmed upon him butterine for butter, there was a saving clause in the Act which provided for that. The section said that if a person purchased goods, and got a written warranty as to the quality of the goods, the person who sold the articles in the

first instance and gave the warranty was liable, if they were found not to be what they were represented to be. A person going into a shop was entitled to get what he asked for, and that was not the case in the present instance; the inspector asked for butter and got butterine. Mr. Makinson held that the case had been clearly proved, and that there need not be any fraudulent intention on the part of the seller to render him liable to a conviction. As to the way in which butterine should be sold he thought it should either be plainly labelled, or that the purchaser should be given to understand that butterine and not butter was being sold. In this case he thought a small penalty would meet the ends of justice, and fined the defendant 2s. 6d. and costs.

**CHICORY AND COFFEE.**—At the South Staffordshire Stipendiary's Court, before Mr. W. F. F. Boughey (stipendiary magistrate), Mr. Thomas Bird, grocer, Spon Lane, was summoned by Mr. J. G. Horder, the inspector under the Sale of Food and Drugs Act for the district of South Staffordshire, for selling adulterated coffee. Mr. Horder's assistant proved to visiting the defendant's shop and asking for a quantity of pure coffee. Having been supplied, the defendant was informed that the coffee had been purchased for the purpose of being analysed, and that a portion of it would be forwarded to the County Analyst. A certificate had been received from Mr. Jones, the County Analyst, stating that the coffee contained 70 per cent. of chicory. The Stipendiary fined the defendant 2s. 6d. and costs.

**ALUM IN BUNS.**—At the Cambridge Petty Sessions last month an adjourned case was heard, in which Mr. T. F. Peacock, baker and confectioner, of King Street, was charged with selling buns mixed with alum, so as to render the said articles of food injurious to health. The Town Clerk prosecuted; Mr. J. W. Cooper appeared for the defendant, and also to watch the case on behalf of Messrs. Smith and Sons, of Norwich, the makers of the "Norfolk Baking Powder." Inspector Phillips said: I went to the defendant's shop and got a packet of baking powder from among a large quantity in a box. I marked it with a cross, and gave it to Mr. Knights to be analysed. I then went to Messrs. Gladwyn & Yockney's, and purchased three packets of the same powder. I put a seal upon each. I gave one to Mr. Knights, one to Mr. Bitton, who supplied me with them. Mr. J. W. Knights, Public Analyst, said: I received from Inspector Phillips a sample of the baking powder, and I analysed it. The following is the result of the analysis:—There was of ground rice 43·0, of burnt alum 15·20, of bitartrate of potash and bicarbonate of soda 41·80. By Mr. Adams: I did not examine for the same parts in the buns that I found in the powder. If three-quarters of a packet had been used for making 4 lbs. of buns it would account for the quantity of alum I found in the buns. By the Mayor: If that quantity was used it would make the buns injurious to health. By Mr. Cooper: If a teaspoonful of powder was put to a pound of flour, in my opinion it would render it injurious to health. I know Mr. Sutton, Public Analyst for the County of Norfolk. If he states that this powder, mixed with bread according to directions (one teaspoonful to a pound), is not injurious to health, he is wrong. I know there is potash among the constituents of this powder in sufficient quantity for me to distinguish it. The Mayor said the question was whether the defendant committed the offence with a guilty intention. Mr. Cooper said that was the first question, and the second was, Was the alum injurious to health? The defendant might possibly have put more powder in than the directions allowed. By Mr. Adams: Four teaspoonfuls of this powder would weigh a little over half-an-ounce. Mr. Cooper submitted that under the 5th Section the defendant was not liable unless he knew that the admixture of that powder would produce the effect, and make it injurious to health. The defendant did not know that the article he put in was injurious to health, and he might have put more in than the directions allowed. He proposed to bring before them the Public Analyst for the County of Norfolk, who would show them that one part of Mr. Knights' analysis of that was without doubt a mistake. The Town Clerk said Mr. Cooper would have an opportunity of going into the question, for they would summon the people for selling the baking powder. Mr. Cooper said he would not go into that case then. The defendant was not liable unless they could show that he had knowledge that the powder was injurious to health. Supposing he did it wilfully, he submitted that he (defendant) did not know the baking powder contained an ingredient that would render it injurious to health. The Mayor: You cannot get over the broad fact that there was alum in the buns. Mr. Cooper said they did not dispute that. The question was whether the defendant knew the powder was injurious to health; if he did not know, they would have to acquit him. Mr. Hurrell said his opinion was that the defendant had done something innocently; but he was innocent of the offence. The defendant said the reason why he used more baking-powder than the directions said was because the buns required more. Mr. Hurrell pointed out to Mr. Cooper that at the end of Section 5 it read "Could he with reasonable diligence have obtained that knowledge." He held he (the defendant) could. The defendant was then sworn, and said: I am a baker, living in King

Street. I have been in the habit of using this Norfolk baking powder ever since I have been there. I use it for buns and nothing else. The flour I used was the seconds flour. I put nothing but baking powder in it. I purchased it of Mr. Bitton from Gladwyn and Yockney's. The quantity of the different ingredients I used to make these buns was  $4\frac{1}{2}$ -lbs. of flour, a little over a quart of milk,  $1\frac{1}{2}$ -lbs. of currants,  $\frac{3}{4}$ -lb. of sugar, and  $\frac{3}{4}$ -lb. of butter and lard together. We put the baking powder into the flour when it is dry, before the dough is made. I had no means of knowing that the baking powder was injurious to health. By Mr. Hurrell: If I had known it contained alum, I should not have used it. Witness continued: There are some papers which say the powder is certified by analysis to be perfectly pure and wholesome, assisting digestion, and that is why I used it. I used this because it requires more in the buns than in the dough to get them light. By the Town Clerk: I read the directions—one teaspoonful to a pound of flour; but that did not make it light, so I used more. The Defendant: I know I am perfectly innocent. Mr. Hurrell: I have no doubt of it. By the Mayor: Assuming I used yeast instead of baking powder, I should use more to buns than to bread. Mr. Cooper said there were some papers which the defendant had with the powder, and which said it was certified by analysis to be perfectly pure and wholesome, assisting digestion; therefore, the defendant thought he need not make more inquiries. He submitted that he came withing the 5th Section, and the case would have to be dismissed. The Mayor, after consulting with the rest of the Bench, and the magistrates were of opinion that the defendant did not use reasonable diligence, and, considering all the circumstances of the case, they fined him 1s. and expenses. Mr. Hurrell said he thought the defendant's character did not suffer in the slightest possible degree.

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#### NOTES OF THE MONTH.

We must, of course, express our satisfaction at the passing of the Act amending the Sale of Food and Drugs Act. It might, no doubt, have been more useful, had it fixed a standard for drugs and milk, as well as spirits; but, such as it is, we accept it as another effort in the direction of improving the quality of our food and drink. The clause by which inspectors are now enabled to obtain samples from street hawkers, costermongers, and stall keepers, will be extremely useful, as it will bring within the provisions of the Act a class of people who have hitherto eluded them, although dealing in the adulterated articles, for selling which shopkeepers have been convicted and fined. We trust the local authorities will accordingly instruct their officers as to the existence of this new provision.

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Milk dealers, too, in their turn, are given the power to have the milk supplied to them examined, and will thus be deprived of the defence so often raised, that they sold the milk in the same state as they received it from the farmer. If they now suspect the milk they are being supplied with to have been watered or tampered with before they receive it, they can get the medical officer of health, or inspector to take a sample at the time the milk is delivered, and, if it has been adulterated, the local authorities can prosecute the farmer in the same way as they do now ordinary tradespeople.

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The last clause of the Act, which enacts that summonses must be served within 28 days from the date of purchase of perishable articles, such as butter and milk, deserves particular attention from analysts. When local authorities meet periodically, and cases are reported to them before proceedings are taken, the enactment will sometimes be inconvenient, as the samples may not reach the analyst in time for him to report thereon at the next meeting of the authorities, and the following meeting two or three weeks afterwards may be after the expiration of the 28 days. This difficulty must probably be avoided, by instructions being issued to the officers to apply for summonses, if necessary, immediately on receipt of the analyses.

The clause referring to the "prejudice question," after the recent decision of the Court of Queen's Bench, is not required so far as England is concerned; but in Scotland, where the Sale of Food Act has been a dead letter ever since the decision of the Justiciary Court, the new clause will, we hope, again set the Act in motion. But an additional provision, which relates to the whole Kingdom, is that which renders it unnecessary to prove that an article is defective in nature, and substance, and quality, before a conviction can be obtained—if it is deficient in one of these respects only, that is sufficient.

With regard to the "spirits" clause, we shudder to find that a flaw has already been discovered in it by an ingenious Yorkshireman. In a letter to a Sheffield paper, the writer states that, although the new Act provides that it shall be a good defence to prove that brandy, say, has not been reduced more than 25 u.p.; yet *it does not provide* that, if reduced *beyond* that limit, such brandy is to be considered adulterated!

The Annual Report of the Local Government Board on the work of Public Analysts contains so much matter of interest to our readers that we have thought it better to reprint it *in extenso*, rather than give an abstract of it. The Report bears out our own figures, which we were enabled to publish several months ago, as regards the decrease in adulteration, the percentage for 1878 being 17·18, as against more than 50 per cent. a quarter of a century ago. So far the operation of the Acts against adulteration have done an enormous amount of good, which we trust will be permanent.

It is, however, extremely amusing to notice the various comments of the trade journals on the report. The *Grocer*, for instance, believes the appointment of Public Analysts has caused no small amount of trouble to the Local Government Board, and that analysts are, indeed, generally troublesome but rarely useful. No doubt Public Analysts *are* troublesome: if not to Government officials, at any rate to that still numerous but happily diminishing class of tradesmen who want to make haste to be rich, *e.g.*, by selling as coffee, at 1s. 6d. a lb., a mixture containing 50 per cent. of chicory, worth half that money; or as cocoa, "arrowroot flavoured with sugar and cocoa," and who do not like their laudable object to be frustrated by means of the Public Analyst.

The *Grocer* waxes jubilant over the fact that the Local Government Board have, as it says, at last adopted an argument of its own in reference to "butterine." The Board see no reason against the use of this article, provided it is invariably sold under a distinctive name, and not fraudulently substituted for the genuine product of the churn. Just so—we also agree with this. Who ever heard of any objection being raised to the sale of dripping *as* dripping? This is much used by poor people instead of butter. But as to butterine, what are the facts? It is an article made to resemble butter as much as possible, and it has been dubbed with a name which seems to have been invented to aid in the deception. Not content, however, with selling such a preparation for what it really is, nineteen out of twenty shopkeepers who sell it have their windows decorated with bills as large as life, "Prime butter 1s. (or less) a pound,"

and customers who buy this are deceived, for no mention is made of its being other than butter, unless, indeed, the inside of the wrapper is stamped "Mixture." It is only when an inspector buys some, and then not till he says what he wants it for, that the shopkeeper says, "I don't sell this to you as butter." No, not to the inspector; but to scores of other customers it has been sold as "cheap butter," and nothing else.

The *Grocer* further points out that the adulteration of coffee has increased, and that mixtures of chicory and coffee are "extensively sold" as coffee, and it particularly directs the attention of grocers to the fact that some preparations of mustard are often sold without the purchaser being informed that they are compounds, and it also notices that some cocoa samples (labelled mixtures) contained only from 10 to 15 per cent. of cocoa. But the *Grocer*, nevertheless, considers that, on the whole, the Local Government Report is "fairly satisfactory," and winds up by remarking that it "should be borne in mind that when the analysts report that they have discovered adulteration, it is now commonly proved—if the case comes into court—that they have made a mistake. The analysts appear to be always making mistakes in this way, and therefore their certificates do not necessarily inspire confidence." This is too much. We were under the impression that we had seen in the *Grocer*, within the past few months, some scores of cases in which it had been proved—in court too—that it was the tradesmen who had made the "mistakes," and been punished accordingly.

No doubt we have been labouring under a strange misapprehension. Although the Local Government Board consider that adulteration is diminishing, and that its character is less noxious than formerly, and although newspapers in all parts of the country do even now occasionally—not to say frequently—contain reports which the tradesmen implicated might not care to rely on in support of their characters for honesty: notwithstanding all this, the inference we draw, that the Sale of Food Act is a very beneficial one, is of course erroneous. The Adulteration Acts were all unnecessary; Public Analysts—that "rarely useful" body—were unnecessary; tradesmen generally, and grocers in particular, could conduct their business properly—if they were pushed to it—and so, quite of their own accord, mind, and quite uninfluenced by any bothering Acts of Parliament, or "troublesome" analysts, tradesmen are now so honourable, that, as the Local Government Board say, it is actually "possible for persons who take reasonable precautions to obtain only genuine articles of consumption." Fancy that! It is true that the Board add, that to do this requires the "help of the Act," but that of course is merely the Board's playful exaggeration.

The Board fear that where small fines are inflicted, tradesmen find it profitable to pay the fines and continue adulteration. A case reported on another page is a good illustration: 2s. 6d. fine for 70 per cent. of chicory, and this when "pure coffee" was asked for. If these small fines were universal, we think it would better protect the public from imposition, if the shopkeeper were compelled to expend the amount in having a large bill printed containing a notice of his conviction, which should be exhibited in his window for three months.

## RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1878. No.	Name of Patentee.	Title of Patent.	Price.
4544	C. A. Fawsitt .. .. .	Obtaining Ammonia .. .. .	4d.
4949	C. W. Siemens .. .. .	Electric Lamps .. .. .	6d.
4982	E. J. Atkinson .. .. .	Calcining Gypsum, Lime, &c. .. .. .	6d.
5139	W. B. Brain .. .. .	Electric Lighting .. .. .	6d.
5281	A. M. Thompson and H. D. Earl .. .. .	Electric Lamps .. .. .	2d.
5291	F. Versman and J. von Quaglio .. .. .	Purifying Coal Gas .. .. .	4d.
5306	T. A. Edison .. .. .	Developing Magnetism and Electric Currents, and Apparatus for Illuminating by Electricity .. .. .	6d.
5307	J. B. Freeman .. .. .	Carbons for Electric Lighting .. .. .	2d.
1879.			
33	R. V. Tuson .. .. .	Disinfectants .. .. .	2d.
49	J. C. Mewburn .. .. .	Manufacture of Phosphorous .. .. .	6d.
65	A. M. Clark .. .. .	Electric Lamps .. .. .	4d.
83	W. Ladd .. .. .	Ditto .. .. .	6d.
152	J. Imray .. .. .	Carburetted Gas or Air .. .. .	2d.
173	S. & M. Baerlein .. .. .	Manufacture of Sulphate of Alumina .. .. .	4d.
178	A. de Meritens .. .. .	Obtaining Light by Electricity .. .. .	2d.
179	W. R. Lake .. .. .	Enriching Phosphates of Lime .. .. .	6d.
277	S. Cohné .. .. .	Electric Lighting .. .. .	4d.
325	E. L. Paraire .. .. .	Electrical Light Apparatus .. .. .	2d.

Mr. Frederick Hodges, F.I.C., Belfast, has been elected Public Analyst for the County of Armagh.

Dr. Cameron, Dublin, has been elected Public Analyst for the County of Monaghan.

**BREAD ADULTERATION IN THE EIGHTEENTH CENTURY.**—In a number of the *Newcastle Courant*, in the year 1759, we read:—"In order to prevent the injurious practice of bakers from adulterating their bread, by noxious and unwholesome mixtures, it was enacted in the 31st year of his present Majesty that persons convicted of adulterating their bread, or having in their possession any mixture or ingredients with an intention to adulterate the purity of meal, flour, or bread, shall forfeit a sum not exceeding £10, nor less than £2, and by the same statute it is directed that the magistrate before whom any such conviction shall be had, may cause the offender's name and place of abode to be published in some newspapers, which shall be printed or published in or near the country, city, or place where the offence shall be committed. Last Wednesday, Thomas Smithers, baker, East Smithfield, was convicted before John Fielding, Esq., in a penalty of £5, for having in his possession a quantity of alum undissolved, and a quantity of alum dissolved, with an intention to mix and adulterate the purity of meal, flour, or bread. \* \* \* If this inquiry be conducted with spirit upon the present plan of discovery, it is to be hoped that it will be the means of saving the lives of numberless poor infants, whose parents are not in a condition to make their children's pap of anything else but common bread."—*Miller*.

We regret to announce the death, at an early age, of Mr. James Whitla, Public Analyst for the County of Monaghan, and a Member of the Society of Public Analysts.

## BOOKS, &amp;c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Boston Journal of Chemistry; The Provisioner; The American Dairyman; The Practitioner; American New Remedies; Proceedings of the American Chemical Society; Le Praticien; The Inventors' Record; New York Public Health; Philadelphia Printers' Circular; Notes on Lubricants, by W. MacIvor.



# THE ANALYST.

OCTOBER, 1879.

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## SOCIETY OF PUBLIC ANALYSTS.

The next Meeting of this Society will be held on Wednesday, the 19th November, at Burlington House.

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### IODIC ACID TEST FOR MORPHIA.

By J. CARTER BELL, F.C.S.

In this note I wish to call the attention of chemists to this most unsatisfactory test. In the chief analytical works iodic acid is quoted as an important test for morphia.

Professor Taylor, in his *Medical Jurisprudence*, says:—"A solution of iodic acid should be mixed with its volume of sulphide of carbon, there should be no change of colour; on adding a small quantity of these mixed liquids to morphia, or its salts, either solid or in solution, the iodine is separated from the iodic acid and dissolved by the sulphide, which sinks to the bottom, acquiring a pink or red colour, varying in its intensity according to the quantity of morphia present. This reaction distinguishes morphia from the other alkaloids which do not decompose iodic acid."

Professor Taylor seems to lay stress upon this test, because at the end of his chapter on morphia, he mentions it again.

In *Watts' Dictionary* the test is also mentioned.

Blyth in his *Manual* says:—"One of the best confirmatory tests is the action of iodic acid." He even goes farther, and gives a special note upon this test, but no precautions.

In *Fresenius' Qualitative*, eighth edition, the test is mentioned, but with precautions as to its use, thus:—"As other nitrogenous bodies (albumen, caseine, fibrine) likewise reduce iodic acid, this reaction has only a relative value; however, if ammonia is added after the iodic acid, the fluid becomes colourless, if the separation of iodide has been caused by other substances, whilst the coloration becomes much more intense if it is owing to the presence of morphia."

The foregoing statements do not accord with my experience: for I find that other substances, such as ipecacuanha, guaiacum, will produce the pink colour; and, also, that ammonia is not able to distinguish between the pink colour of morphia and that produced by other substances.

This statement may be easily verified by putting into a test tube 2 c.c. of a solution of iodic acid (one part of the acid to 15 of water), and 2 c.c. of bisulphide of carbon; to this mixture is added a milligramme of hydrochlorate of morphine, and, on shaking, the beautiful pink colour is communicated to the bisulphide of carbon; on adding 5 drops of ammonia, the colour disappears. A few drops of ipecacuanha wine, in the place of the morphia, will produce the same result. Such a doubtful test ought to be banished from all toxicological works; or, if mentioned, should be qualified by this statement—that if no pink colour is produced, the absence of morphia may be presumed.

ON THE RELATION BETWEEN DR. KOETTSTORFER'S PROCESS OF BUTTER ASSAY, AND THE OLD PROCESSES.

By G. W. WIGNER, F.C.S.

*Read before the Society of Public Analysts, at Sheffield, on 22nd August, 1879.*

DR. KOETTSTORFER'S process appeared to me likely to prove very valuable in the ordinary analyses of butter, by at least disposing without further labour of most of the genuine samples; but it was obviously impossible to adopt a new process as a basis of an adverse report, until it had been thoroughly tested. It appeared to me, that the most practical mode of testing it was to submit to this process (in addition to the tests which would otherwise have been made) every sample of butter or other fat which was received. I therefore adopted it as an auxiliary process, and have examined nearly 100 samples by it.

As a general opinion, I may state that I am well pleased with the process for the purpose above mentioned. It is not, however, free from its weak points.

Carbonic acid acts very much on the colour of phenol-phthalein, and, in order to ensure fair accuracy, it is essential that the fat should be saponified with the alcoholic potash solution in a flask, which certainly ought to be corked with a cork having a notch in the side. While the alcohol itself is boiling pretty freely there is, of course, no risk of carbonation, but, as soon as the water is added to dilute the soap for titration, the risk increases greatly.

My experience also indicates the necessity for the use of a very large excess of potash solution, an excess very much larger than would be ordinarily employed when the fatty acids were to be weighed. It appears desirable to use at least twice as much potash as would be actually required to combine with the soap present.

Again, in reference to the potash solution itself. I find that a very small amount of colour seriously masks the end of the titration, and it becomes essential to use pure potash, and to keep the solution in hard glass bottles, so as to prevent the additional colour which is often imparted by the decomposition of the glass of common *Winchesters*.

Taking all these precautions, however, I find the process a useful one. But I must call special attention to the following exceptions:—It is comparatively useless when applied to old samples of butter, which have been alternately heated, and cooled; and, even in the cases of lard and butterine, repeated heating exercises a more uncertain effect than it does on the fatty acid determination; but, although useful, it can never come into general use as a substitute for the determinations of fatty acids and soluble acids, because any alkalis added to the fat, whether fraudulently, or for supposed preservative purposes, entirely upset the estimation. Therefore, while it may be—and in my opinion is, when properly carried out—a safe process on which to pass a butter as genuine, it is quite unreliable as a proof that the butter is adulterated. The admixture of three per cent. of carbonate of soda with the salt added to the butter, will, by this process, change the results so much, that a genuine butter would be condemned; and such a percentage of admixture is one that has been used, while smaller percentages are common.

By the fatty acids' process, such an admixture would have scarcely any sensible effect, but it would exercise a very important effect on the actual density of the fat, and, indeed, in certain cases, might render the determination of actual density quite fallacious. Unfortunately merely testing the water present in the sample of butter for alkalinity is not sufficient to prove whether alkaline carbonates have been added, and no test seems readily available. I have, therefore, come to the conclusion that it is unsafe and unjust to condemn any sample of butter as adulterated on either the titration or specific gravity processes. If the sample passes these tests well it may be relied on as genuine, but it may fail to answer both tests, and yet have no foreign fat mixed with it. In such a case, a full determination of both soluble and insoluble fatty acids, is the only safe course to adopt.

Of course, therefore, I view the relation between the actual density, fatty acids and titration results as a matter of no great importance in adulterated samples, but in genuine samples it is otherwise.

Dr. Koettstorfer found that the amount of KHO required by genuine butters ranged from 23·24 to 22·15 per cent. It is, of course, with the lowest limits only that we have to concern ourselves, and my opinion is, that this limit is not low enough even in the case of fresh samples, and that it is very seriously deficient in the case of samples which have been kept and subjected to even moderate variations of temperature.

I have had several samples of butter apparently recently made, and, certainly, in good condition, which have required as little as 21·34, 21·36, 21·50 per cent. of KHO to saponify them, and which have yet given less than 89 per cent. of fatty acids by the flask washing process, and which, independently of the other conditions, I certainly would not condemn as adulterated. In my opinion, therefore, the titration process can only be relied on when it shows figures higher than Koettstorfer has put as the limits.

As, however, three samples out of every four received are probably genuine, the process may be advantageously used for passing these pure samples, provided proper care is taken to carry the analysis further if these results are adverse, and it is for this purpose only that the process can come into general use.

I think that any sample of butter fat, which requires more than 22·60 per cent. KHO for saponification, as determined by the titration process, may safely be passed as genuine; but that any lower result should be checked by a full analysis.

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#### ON THE RATIO OF EXPANSION BY HEAT OF BUTTER FAT, LARD FAT, AND BUTTER SUBSTITUTES.

By G. W. WIGNER, F.C.S.

I HAVE made some accurate determinations of the ratio of expansion of fats, especially butter fat and the fats used for adulterating butter. These determinations will be of service, since, by their use, the specific gravity of melted fats may be taken at temperatures varying within reasonable limits from the 100° F. usually adopted, and the results so obtained may be directly compared with the specific gravity at 100°. They will, also, have the advantage of rendering the use of the specific gravity bubbles, which I proposed some years ago\* for this purpose, more convenient.

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\* See ANALYST, vol. i., p. 145.

I have tested the ratio of expansion of butter fat for every 5° between 100° Fahr. and 212°. The determinations have been made independently by three different processes.

1st. By direct weighing of the melted fat in a specific gravity bottle, with thermometer stopper. At the higher temperatures this method is certainly open to greater errors than are desirable, on account of the low conductivity of the melted fat for heat, which renders it a long task to secure an absolute temperature throughout the bottle.

2nd. By means of thermometer tubes with large bulbs. This process would, probably, give the most accurate results, if it were not for the tendency of the different fats to crystallize, and, apparently, to some extent to separate when enclosed in the bulb, without the possibility of agitating them.

3rd. By means of specific gravity bubbles of various weights. This latter process gives results slightly inferior in accuracy to the other processes, when they are carried out in the most careful way; but it is yet so simple and certain in its results, that it is impossible, with ordinary care, to incur any error which is of importance, when the process is used for analytical purposes.

I have not corrected the figures for the cubical expansion of glass, because the results are primarily intended for the use of analysts who will weigh the fats, or measure them in glass vessels, as I have done.

*1st. Expansion of Pure Butter Fat.*—100 volumes of pure butter fat, at 100° F., expand to 1047.2 volumes, at 212° F. This result is the average of seven closely agreeing determinations, on four different samples of butter. This gives an average expansion of .0434 per degree F., or .0780 per degree Centigrade.

The ratio of expansion is not absolutely uniform throughout, but differs between 150° and 190° F. From 100° F. to 150° F. it is sensibly in accordance with the average; from 150° F. to 190° F. it increases slightly; and from 190° F. to 210° F. it appears to expand at its former rate of .0434°. This change in the ratio of expansion is more clearly shown by the lithographed diagram which accompanies this paper.

At first I was inclined to attribute this change to a partial decomposition of some of the constituents of the fat; but, on examining a sample of lard in the same way, I found that an almost identical change took place, and at nearly the same temperatures. Since lard has already been melted at much higher temperatures, and is practically free from the soluble and volatile fatty acids, this explanation seems doubtful.

An artificial butter—"butterine," also showed a similar abnormal rate of expansion, but I cannot speak so exactly as to the temperatures at which the ratio changed.

*2nd. Expansion of Lard and Butterine.*—The average expansion of lard and butterine (animal) are almost identical. The average ratio for lard, as deduced from the experiments, is .0420 per degree F. The difference from the butter ratio is so small that it is of no importance for analytical purposes, except for wide ranges of temperature.

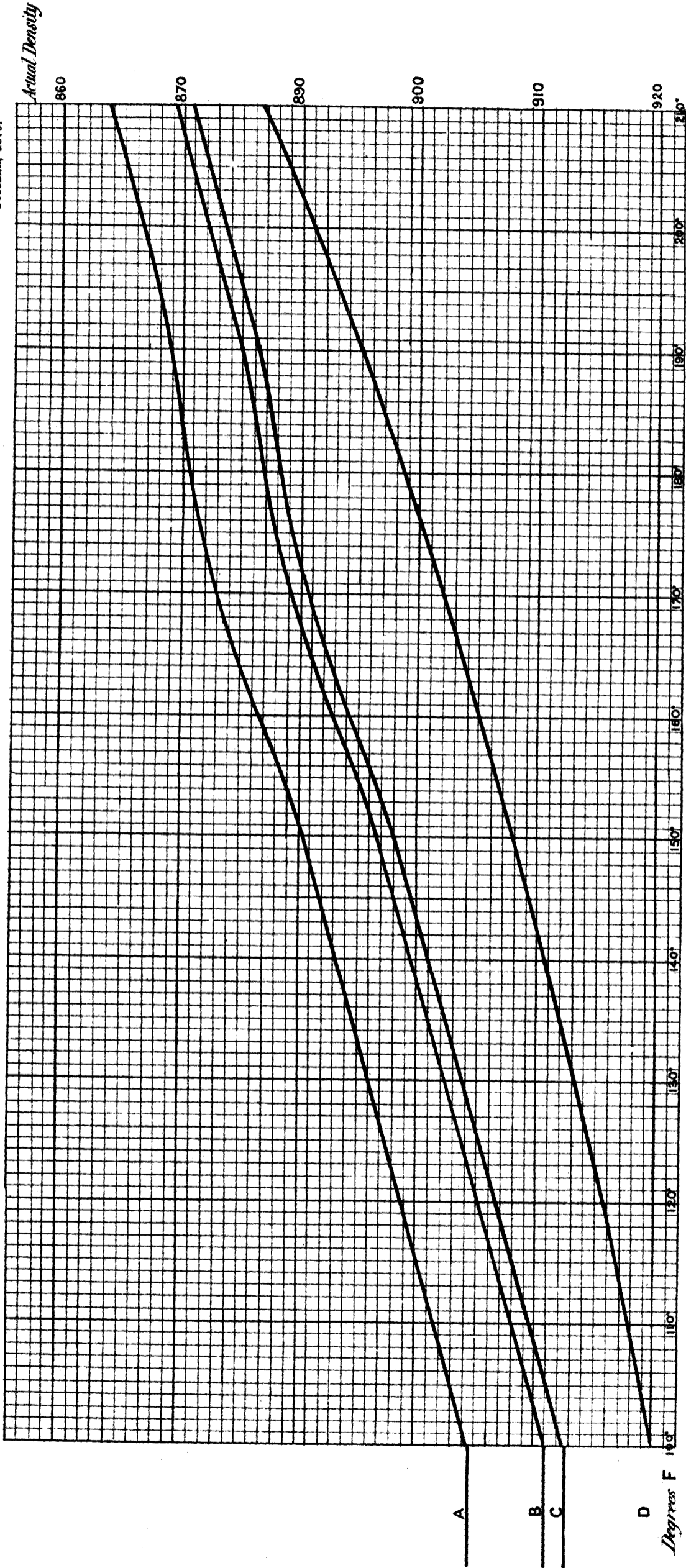
It will be more convenient for the use of these figures in the detection of adulteration, to reduce these results to the ordinary figures of actual density, as compared with water at 100°. Actual density, strictly speaking, is weight, as compared with the weight of the same bulk of water at the same temperature, and it was in this sense that Muter first used the term in butter analysis, but it is not convenient to

RATIO OF EXPANSION OF FATS

G. W. WIGNER,

"The Analyst,"

OCTOBER, 1879.



- A Actual Density of Lard as combined with water at 100°
- B " " Butter of 911° Actual Density.
- C " " Mixed Butters of 912.5 Actual Density.
- D Curve of Expansion of Water. (The figures of weight do not apply to this curve.)

follow this rule at temperatures above 100°, because whereas water expands more rapidly with increase of temperature, fats do not do so. I therefore compare all the figures obtained with water at 100° as the standard.

Assuming the limit of 911 as the lowest average actual density of a genuine butter at 100° F., we obtain the following rule :

If the temperature exceed 100° F., add to the actual density found by weighing .377 per 1° F. of excess temperature over the 100°.

It is obvious that the correction to be applied to fats, of slightly lower specific gravity, will scarcely differ from this. In practice it will generally be found that more accurate results can be obtained, by allowing for the error of temperature by this calculation, than by endeavouring to secure an absolute temperature of 100° F.

The diagram of the expansion of the fat will, however, be of assistance in enabling the specific gravity bubbles to be used for the purpose of taking the actual densities of fats. These bubbles expand under the influence of heat, very nearly in the same ratio as the ordinary specific gravity bottles; in other words, notwithstanding the different conditions under which specific gravity bottles and bubbles are made, the cubical expansion corresponds very closely, and, consequently, in this respect no sensible error is incurred by the use of the bubbles, since the results obtained are practically identical with those which would be obtained by weighing in glass bottles. An accurate determination of the specific gravity of a bubble, at a temperature of 60°, will be all that is necessary; or, if preferred, the actual specific gravity of the bubble may be found by testing it on melted fat, the actual density of which has been accurately determined at 100°, and calculating the result obtained from the expansion of the fat.

I need hardly point out that it is useless to rely on any approach to accuracy in the bubbles as sold. I believe this inaccuracy is mainly due to the bubbles being marked before the glass has assumed its permanent form.

If the sample of fat to be tested is gently and slowly heated, until the bubble of known specific gravity begins to fall, and the temperature of the fat noted, a glance at the diagram will show at once the actual density of the fat at 100° F. Every degree F. difference of temperature corresponds to .377 of actual density, and, as it is perfectly easy to determine the sinking point to .5 F., the actual density can in this way be ascertained to within .20, which is as near an approach to accuracy as is requisite in most cases, or even practicable, from a single experimental weighing. Should the specific gravity determinations not coincide with those of a genuine fat, a further analysis is in any case essential.

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#### BRITISH PHARMACEUTICAL CONFERENCE.

*The following are abstracts of some of the Papers read at the Meeting at Sheffield in August last :—*

#### NOTES ON PETROLEUM SPIRIT OR "BENZOLINE."

BY ALFRED H. ALLEN, F.C.S.

ALTHOUGH it is well known to professional chemists that petroleum spirit is composed of hydrocarbons quite distinct from those constituting coal-tar naphtha, among the general public, and to a certain extent among people possessed of some knowledge of

chemistry, great confusion has arisen as to the nature of the liquids known in commerce as "benzine," "benzene," "benzol," and "benzoline." Of these, the hydrocarbon *benzol* or *benzene*,  $C_6H_6$ , is the chief and characteristic constituent of coal-tar naphtha, while it is present in very insignificant amount in petroleum spirit or mineral naphtha. The terms *benzine* and *benzoline* have no scientific application, and are merely commercial names for petroleum spirit. It is owing, in a great measure, to the similarity of these names to those of the chief constituent of coal-tar naphtha that confusion has occurred, but it has been made far worse by the accidental or intentional substitution of one liquid for the other, until it is difficult to obtain the coal-tar product retail, even when it is asked for by its proper name. This would be of but little consequence if the two liquids were of exactly similar nature, but in certain cases they present decided differences of behaviour, although in general characters there are very close resemblances.

The following tabular statement of the characteristic differences between petroleum spirit and coal-tar naphtha has been compiled from various sources and includes a few original tests. All the characters given have been carefully verified by actual experiment on representative samples of commercial petroleum spirit and coal-tar benzol.

*Petroleum Spirit, "benzoline," or  
"benzine."*

1. Consists of *heptane*,  $C_7H_{16}$ , and its homologues.
2. Heptane contains 84.0 per cent. of carbon.
3. Burns with a somewhat smoky flame.
4. Commences to boil at 54° to 60° C.
5. Specific gravity about .69 to .72.
6. Smells of petroleum.
7. Dissolves iodine, forming a solution of a raspberry red colour.
8. Does not sensibly dissolve pitch, and is scarcely coloured by it, even on prolonged contact.
9. When shaken in the cold with one-third of its volume of fused crystals of absolute carbonic acid, the latter remains undissolved.
10. Requires two volumes of absolute alcohol, or four or five volumes of methylated spirit of .828 specific gravity for complete solution at the ordinary temperature.

*Coal-Tar Naphtha, or  
"benzol."*

1. Consists of *benzene*,  $C_6H_6$ , and its homologues.
2. Benzene contains 92.3 per cent. of carbon.
3. Burns with a very smoky flame.
4. Commences to boil at about 80° C.
5. Specific gravity about .88.
6. Smells of coal-tar.
7. Dissolves iodine, forming a liquid having the colour of a solution of potassium permanganate.
8. Readily dissolves pitch, forming a deep brown solution.
9. Miscible with absolute carbonic acid in all proportions.
10. Miscible with absolute alcohol in all proportions. Forms a homogeneous liquid with an equal measure of methylated spirit of .828 specific gravity.

Although the foregoing tests are abundantly sufficient for the distinction of petroleum spirit and benzol, when applied to mixtures of the two products they are of but little value even as qualitative indications, and in that case the density is the only one of the above characters which is capable of giving even an approximation to the quantities in which the constituent liquids are mixed.

The action of nitric acid on coal-tar naphtha is well known to result in the formation of nitrobenzene and its homologues, and has been employed by Schorlemmer for detecting traces of benzene, &c., in petroleum. On the other hand, the action of nitric acid on the hydrocarbons of the paraffin series, which constitute practically the whole of petroleum spirit, is almost *nil* in the cold, even if fuming acid be used, and is very

limited in extent if hot acid be employed, provided that the very strongest be avoided. I found by experiment that the action of nitric acid on petroleum spirit was, under certain conditions, even more limited than I had supposed, and eventually I found that by employing the acid in a particular manner, it was not only possible but easy to effect a tolerably perfect quantitative separation of coal-tar naphtha and petroleum spirit.

The following was the mode of treatment eventually employed, and, by adhering to it, it is possible to detect and approximately estimate the proportion of petroleum spirit existing in a mixture of it with benzol, in ten or fifteen minutes :

A known measure of the sample (from 4 to 6 c.c.) was treated with four times its measure of yellow nitric acid of 1.45 specific gravity. The mixture was made in a flask, to which a condensing arrangement was attached. Slight heat was applied externally by means of a flame if the spontaneous action was not sufficiently vigorous. After about five minutes the contents of the flask were cooled, and then poured into a narrow graduated tube. Any oily layer was measured and removed with a pipette, and the remaining liquid poured into a large excess of water.

When ordinary petroleum spirit is thus treated the nitric acid becomes coloured more or less brown. Very little heat is evolved, but on applying moderate heat externally the production of red fumes proves the occurrence of a certain amount of action. The effect, however, is not so violent as I had anticipated from a perusal of Schorlemmer's description of the reaction, and, if the experiment be carefully made, the petroleum spirit employed forms a layer on the nitric acid, and on transferring the liquid to a graduated tube is found to occupy the original volume of the sample used. This is true whether petroleum spirit alone be operated on or whether it be previously mixed with various proportions of coal-tar naphtha. If the proportion of the latter be large, the quantity of nitrobenzene formed is larger than can be retained in permanent solution in the nitric acid. This fact causes no inconvenience, for the nitrobenzene forms a separate layer below the petroleum spirit, and in presence of nitric acid is not miscible with it. Nitrobenzene and petroleum spirit are perfectly miscible alone, but on shaking the mixture with strong nitric acid the nitrobenzene is dissolved out. It will be seen, therefore, that the reaction with nitric acid may be conveniently employed for the determination of petroleum spirit in admixture with benzene. Very fair approximate results are obtainable. If the layer of petroleum spirit be removed with a pipette and shaken with water to remove dissolved nitrous fumes, it is obtained in a suitable condition for further examination.

If, after removing the layer of unacted-on petroleum spirit, the nitric acid solution be poured into water, a very sensible turbidity is usually produced, even with petroleum spirit free from coal-tar products, and on filtering off the precipitate, or allowing it to settle, and decanting the liquid, distinct evidence of the formation of nitrobenzene is obtainable by the aniline test. When the more volatile portion of petroleum spirit is thus treated, the nitric acid is scarcely coloured at all, and hardly a trace of milkiness is produced when the acid is poured into water. The brown colour and turbidity on dilution increase with the boiling point of the sample of naphtha, and are strongest with kerosine oil; but in all cases in which petroleum products are treated with nitric acid, the quantity of precipitate on dilution is very insignificant. Although nitrobenzene is



recognizable among the products of the action of nitric acid on petroleum spirit, as was shown long since by Schorlemmer, I do not think the turbidity produced on dilution is due solely to its formation. It is probably rather due to the production of various nitro-substitution products, as it is well known that the higher numbers of the paraffin series are far more readily acted on by nitric acid than their lower homologues.

I have attempted to determine the proportion of benzene in a mixture with petroleum spirit, by measuring the nitrobenzene produced, but the results have not been satisfactory, partly in consequence of the solubility of nitrobenzene in water and acid liquids. By employing 250 c.c. of water for dilution, allowing the nitrobenzene to settle completely, decanting the greater part of the water, and pouring the "bottoms" into a graduated tube, the nitrobenzene may be readily measured. If an allowance of 1.5 c.c. be made for solubility in the one-quarter litre of acid liquid, the measure of benzene present in the sample taken may be roughly ascertained by multiplying the number of c.c. of nitrobenzene obtained by the factor 0.85. Thus if V be the volume in c.c. of nitrobenzene, then the benzene in the amount of sample taken was  $(V+1.5) \times 0.85$ . The method is not capable of giving actual results, but may be useful in some cases as a check on the determination of petroleum spirit by measurement of the layer insoluble in nitric acid.

With a view of learning something respecting the proportion of heptane present in ordinary petroleum spirit, I made a mixture in equal measures of four samples of commercial "benzoline," such as is used for sponge lamps. This mixed specimen had a density of .7001 at 15.5° C., and commenced to boil at about 54° C. It was distilled in the manner first described by Warren, in a flask furnished with an inverted condenser, filled with water, maintained at a temperature of 70° C., a second condenser being kept well cooled by a current of cold water. The distillation ceased when the temperature in the flask was 84° C., that is, 14° C. above that of the first condenser. The water in the first condenser was then raised to the boiling point, and the distillation continued till scarcely any more came over, by which time the contents of the flask were at 114° C. The result of the distillation was as follows—for 100 measures of petroleum spirit taken:—

	Condensed below 70° C.	Condensed between 70° and 100° C.	Condensed above 100° C. (residue).
Percentage by measure .. .. .	16	56	26
Density at 15.5° C., compared with water at same temperature .. ..	.667	.707	.742

The loss was about 2 per cent. of the original measure. Another specimen of petroleum spirit gave 22½ measures of distillate with the receiver at 70° C., 42 per cent. between 70° and 100° C., and 32 per cent. of residue; the loss being 3½ per cent. The densities of the three products were almost identical with those previously obtained.

The observed specific gravities of the first and second distillates correspond approximately with the recorded densities of hexane and heptane, and from this and the known boiling points of these liquids it is evident that the portion of petroleum spirit not condensed at 70° C. will consist chiefly of hexane and lower homologues, while the part condensed at 70° C., but distilling at 100° C., will be chiefly heptano

and isoheptane. As, in the experiments described, this fraction measured from 42 to 56 per cent. of the entire spirit, it is evident that the proportion of heptane present equals if it does not exceed that of all the other constituents.\*

### NOTE ON THE SPECIFIC GRAVITY OF LIQUIDS.

By L. SIEBOLD, F.C.S.

While the great usefulness of the hydrometer for the rapid determination of the specific gravity of all kinds of clear liquids is universally recognized, there appears to be anything but unanimity of opinion as to the value of this instrument as an indicator of the specific gravity of mixtures owing part of their weight to the presence of undissolved or suspended matter. I have therefore made a number of experiments with the object of deciding whether or not the indications of the hydrometer may be depended upon in the case of mixtures containing insoluble powders, oils, resins, &c., uniformly suspended. The results were as follows:—

*Mixtures of Precipitated Chalk, Mucilage of Acacia, Syrup and Water—*

No.	Specific gravity by hydrometer.	Specific gravity by balance.
No. 1. .. .. .	1.106	1.1066
„ 2. .. .. .	1.070	1.0710

*Mixtures of Magnesia, Mucilage and Water—*

No.	Specific gravity by hydrometer.	Specific gravity by balance.
No. 1. .. .. .	1.059	1.0598
„ 2. .. .. .	1.036	1.0359

*Mixture of Precipitated Chalk and Water only—*

Specific gravity by hydrometer.	Specific gravity by balance.
1.037	1.0396

The difference in this case arose from the fact that it was impossible to read off the specific gravity quickly enough, for in the absence of the mucilage or any other binding substance, the chalk began to subside immediately after shaking, thus causing a continual decrease in the specific gravity.

Mixtures containing subnitrate of bismuth, heavy spar and other mineral powders, each suspended by mucilage, were tested in the same manner and likewise gave concordant results.

*Emulsions of Oil of Almonds, Gum Acacia, and Water—*

No.	Specific gravity by hydrometer.	Specific gravity by balance.
No. 1. .. .. .	1.010	1.0110
„ 2. .. .. .	1.007	1.0070

*Emulsion of Copaiba, Mucilage and Water—*

Specific gravity by hydrometer.	Specific gravity by balance.
1.014	1.0144

\* The physical properties of the benzoline examined by me are very different from those attributed to the liquid by Wiederhold, who on fractionally distilling benzoline of .715 sp. gr., which commenced to boil at 60°, obtained—

48.6	per cent. of	.70	sp. gr.,	boiling at	100°.
45.7	„	.73	„	„	200°.
5.7	„	.80	„	„	above 200°.

*Various samples of Milk—*

No.	Specific gravity by hydrometer.	Specific gravity by balance.
No. 1.	1.030	1.0305
„ 2.	1.028	1.0278
„ 3.	1.032	1.0316
„ 4.	1.029	1.0300

*Official Mucilage of Acacia—*

Specific gravity by hydrometer.	Specific gravity by balance.
1.165	1.1670

The last determination was made in order to see whether the great viscosity of the liquid would have any notable effect on the indications of the hydrometer.

All the determinations were made at 62° F. The set of hydrometers used consisted of instruments specially made for very short ranges of specific gravities, the correctness of which I had frequently checked in previous determinations.

The foregoing experiments prove that carefully made hydrometers afford reliable indications of the specific gravities of liquids, no matter whether their gravity is due to dissolved or suspended substances.

## THE APPLICATION OF CHLOROFORM IN THE TESTING OF DRUGS.

By L. SIEBOLD, F.C.S.

In the 'Year-Book of Pharmacy' for 1877 there occurs an abstract of an article by Dr. C. Himly on the Detection of Mineral Adulterants in Flour by means of Chloroform. Having frequently tried this test and finding it extremely useful both as a qualitative and as a quantitative process, it appeared to me desirable to ascertain to what extent it might be advantageously employed in the testing of powdered vegetable drugs. As many of the latter are lighter than chloroform, and the usual mineral adulterants sink in that liquid, it was but reasonable to infer that this mode of separation might prove of value to the pharmacist.

I will not trouble the meeting with the details of my experiments, but confine myself to a brief summary of the results. In each experiment a small quantity of the dry powder was well shaken with about half a test-tubeful of chloroform, and the mixture allowed to stand at rest for twelve hours. The following drugs were found to rise so completely to the surface of the chloroform, that the observation and estimation of any mineral adulterant became a very simple and easy task:—Acacia, tragacanth, starches, myrrh, Barbadoes aloes, jalap, saffron, cinchonas, nux vomica, mustard, white pepper, capsicum, and guarana. Known quantities of selenite and of chalk were added to these drugs, and subsequently determined by running the lower stratum of the chloroform with the sediment into a small dish, carefully pouring off the chloroform, drying the sediment at a gentle heat and weighing it. The result in each case was very satisfactory. No such accuracy could be attained by incineration, as in the presence of chalk there was always a loss of carbonic acid, and in that of selenite a loss of water and of oxygen, the sulphate being partly reduced to sulphide. An estimation of these adulterants by the usual analytical processes would, of course, give exact results, but prove much more tedious.

Both for qualitative and for quantitative purposes, the chloroform test therefore

answers extremely well with the drugs named. In the case of the following substances no complete rise to the surface of the chloroform took place, but a portion was found to float and another portion to sink, though the absence of mineral adulterants was proved by analysis:—Gamboge, scammony, opium, Socotrine aloes, liquorice root, ginger, colocynth, coussou, ipecacuanha, cinnamon and cardamoms. Of the last two by far the greater portion was found to sink in chloroform. But even in these cases the test is not altogether without value, for a careful inspection of the sediment will show whether or not it is a mixture of various substances, differing in appearance, weight, &c. The mineral adulterant will generally, in such a case, form the lowest stratum of the sediment. A comparison with a genuine sample helps to arrive at a correct conclusion. Moreover the chemical examination of the sediment gives results which cannot always be obtained by testing the ash. Take the case of cinnamon, for instance, which contains organic calcium salts. These upon incineration leave calcium carbonate, and a qualitative analysis of the ash would therefore fail to show whether this calcium carbonate was solely the result of ignition, or whether a part of it pre-existed in the cinnamon powder as an adulterant; while the addition of hydrochloric acid to the lowest stratum of the chloroform sediment would settle this point at once.

It is, however, in the case of the drugs first named that I wish specially to recommend this mode of testing to pharmacists.

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#### ON THE VALUATION OF CITRATE OF IRON AND QUININE.

By FREDERICK W. FLETCHER, F.C.S.

THE author said that observations have hitherto been confined, with scarcely an exception, to the determination of the total alkaloid present in the citrate, without regard to its purity as quinine. He had adapted to this salt the process described by Dr. Paul for testing quinine, in the valuable paper which he communicated to the Pharmaceutical Society at an evening meeting in February, 1877. Dr. Paul had stated that a sample of sulphate of quinine, containing an admixture of no less than 90 per cent. of cinchonidine, might, if examined by the Pharmacopœia test, be passed as pure quinine. The author had found 10, 15, and even 25 per cent. of sulphate of cinchonidine in foreign quinines, which would, however, pass the Pharmacopœia test. Nor will the Pharmacopœia test detect cinchonidine in citrate of iron and quinine. The alkaloid obtained from the citrate in the manner directed in the Pharmacopœia will dissolve in pure ether, even though 25 per cent. of its weight is cinchonidine. The adaptation of Dr. Paul's plan of fractional crystallisation, which the author had devised, is easy of application, and although a considerable quantity of the citrate has to be operated upon, there is little or no loss of quinine, most of the alkaloid being recovered as sulphate. It has, moreover, the advantage of combining three operations in one, as the results indicate:—(1) The exact amount of anhydrous alkaloid; (2) the proportion of the latter which can be converted into crystallisable sulphate of quinine, and (3) the percentage of alkaloids other than quinine.

The operations involved are briefly as follows:—Place 20 grammes of the citrate in 100 c.c. flask, dissolve in 50 c.c. of distilled water, and add gradually an excess of ammonia (960), shaking well after each addition. This is important, in order that the

quinine may separate in a state of fine division, as otherwise it is apt to be thrown out in tough lumps, difficult of subsequent solution. Pour in 25 c.c. of washed ether, and agitate with a rotatory motion till the alkaloid has completely dissolved. Transfer the mixture to a small glass separatory funnel, and having run the lower stratum of liquid back into the flask, pour the ethereal solution into 100 c.c. platinum capsule. Treat the liquid in the flask with 20 c.c. more ether, and proceed as before. Repeat this operation a third time. The capsule containing the mixed ethereal solutions is then placed in a saucer of water, and the ether blown off by a current of air from a Fletcher's bellows. This immersion of the capsule in water obviates the tendency of the ether to creep up the sides. The platinum dish, which will now contain a pasty residue, is next placed in the air-bath, previously heated to  $120^{\circ}$ , and in 15 minutes desiccation is complete. After cooling in an exsiccator, the capsule is covered and removed to the balance. The weight, minus that of the capsule and cover, multiplied by five, is the percentage of total alkaloid. The author had made many hundreds of analyses by this process, and in cases where a determination had been repeated had never found the results vary more than 0.1 per cent. When an estimation of total alkaloid only is required, 2 grammes of citrate is a sufficient quantity to operate upon.

The anhydrous alkaloid is now to be converted into basic sulphate. According to calculation the weight of anhydrous alkaloid in grammes is multiplied by 80.86, and the number of c.c. of decinormal sulphuric acid thus indicated are run into the platinum capsule from a burette, and the former being placed on wire gauze over the flame of a rose burner, the contents are briskly stirred until the alkaloid is all taken up, and a clear solution obtained. This is then transferred to a flask and allowed to cool spontaneously. The crystalline mass which will have formed is thrown on a small calico filter, about 8 inches square, stretched over a beaker, and, when drained, tightly squeezed to remove the last few drops of liquid. The latter is then filtered into a stoppered graduated tube of about 150 c.c. capacity, and its volume noted. Twenty c.c. washed ether and an excess of ammonia are then introduced, and the whole, after being well agitated, set aside for six hours.

In the meantime the squeezed residue is detached from the calico filter, and dried in the air-bath at a temperature of  $100^{\circ}$  C. The weight multiplied by 1.18 represents its value as crystallised sulphate of quinine. To this is added the amount of the latter contained in the mother liquor which has been separated (and which may be estimated to contain 1 part in 750), and the total will then represent the proportion of anhydrous alkaloid which can be converted into sulphate.

At the expiration of the time mentioned, the tube which has been set aside is examined, when the cinchonidine and quinidine present will be found to have crystallised out, at the junction of the two liquids. The stratum of ether is removed by a small Nessler pipette; the crystals washed with two successive portions of 10 c.c. of ether, the last few drops of which can be absorbed by a little roll of filter paper. The crystals are then thrown upon a double-tared filter, made, of two papers weighed one against the other, by cutting down the heavier, dried at  $120^{\circ}$ , and placed on the balance, the outside paper acting as a counterpoise. In practice the author finds that the weight of this first crop of crystals represents on an average two-thirds of the total cinchonidine

or quinidine present. If, therefore, the amount does not exceed .1 gramme, the percentage of these alkaloids may be estimated to be below 5 per cent. Should the first weighing exceed this limit, the sulphate obtained from the first crystallisation must be dissolved in 100 c.c. boiling water, and treated as before, the weight of alkaloid separated by ether being of course added to the amount first obtained.

As thus described, the process may seem tedious, but in reality it is not so. Not counting the time which must be allowed for crystallising, the entire estimation may be completed in something under two hours. The method, of course, does not distinguish between quinidine and cinchonidine, the usual tests for which must be applied to the solution of the mixed sulphates. This, however, is a point of minor importance. Two examples will be sufficient to illustrate the working of the process.

Descriptions of experiments were then given, and the author added in conclusion :—

Whether the presence of 5, 10, or 20 per cent. of cinchonidine would bring a sample of citrate of iron and quinine, which nevertheless answered the B.P. test, within the reach of the Adulteration Act is a point upon which I offer no opinion. An eminent analyst with whom I was lately discussing the point took the negative view. If such is really the case, a revision of the Pharmacopœia will come none too soon. The plausible excuse which is sometimes set up that manufacturers cannot perfectly separate the cinchonidine from the quinine except at a greatly enhanced cost is utterly without foundation. The white sulphate manufactured both by Messrs. Howard and Mr. Whiffen I have never found to give the slightest reaction with Paul's test, and, what is a still more striking fact, the so-called unbleached quinine of the latter maker is frequently quite free from cinchonidine. Certain of the foreign makers are also, as a rule, unimpeachable in this respect, whilst, on the other hand, some others are systematically adulterated.

It may be worth noting, as a matter of practical interest, that the substitution of 1 per cent. of cinchonidine for quinine in the manufacture of citrate of iron and quinine reduces the value  $\frac{1}{4}$ d. per oz. for each such addition; and when it is remembered that the Pharmacopœia test will easily pass 20 per cent. of cinchonidine, and that the consumption of the citrate is considerably over 100,000 oz. per annum, the valuation of this preparation becomes a question of commercial as well as of chemical interest.

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#### ANALYST'S REPORT.

THE ADULTERATION OF MILK.—Dr. C. Meymott Tidy, the medical officer of health for Islington, in his annual report which he has just issued, states that during the year ending Lady-day, 1879, he examined 172 samples of food, and, except in the milk, he found no such evidence of adulteration as warranted him in advising a prosecution. In 12 of the milk cases he gave certificates of adulteration. They were all cases of added water, the adulteration varying on the lowest possible calculation from 10 to 30 per cent. Dr. Tidy adds :—“The milk-sellers have raised the price of their milk, but I can scarcely say that the quality has been improved, the price being, in fact, no guarantee of genuineness. The extent to which milk is adulterated is serious. For we must remember that to many (and those for the most part the very old and the very young) milk constitutes the sole article of diet. The doctor can easily be thwarted in his treatment of a patient by the dairyman. The public are in this way cheated of their money; and if that were all it would be bad enough, but they are cheated of their health too. And yet during this year only a single sample of food was submitted to me by the public for examination, and that one article was not milk, but whisky.” In concluding his report Dr. Tidy says :—Would it not

be worth while, remembering that there are yet so many things to be attended to, and so many reforms needed, in respect chiefly to the drinking habits of the people and their method of life, for sanitarians to turn their attention for a few years to these sadly-neglected topics, instead of confining their thoughts almost exclusively, as they have been doing of late years, to the water as the source of all ills and miseries? It is not simply the time wasted on the subject that is to be deplored, but it is the unnecessary alarm the discussion of such subjects excites in the public mind."

### LAW REPORTS.

**CAMBERWELL BUTTER CASE.**—At the Lambeth Police Court, a charge of selling adulterated butter was investigated. The case had previously been remanded on the application of the defendant, Mr. A. Bullard, cheesemonger, New Church Road, that the sample might be sent to Somerset House for analysis. On the case being proceeded with on the 13th September, the magistrate read the following certificate, which had been received from the Somerset House authorities, signed by Messrs. R. Bannister, G. Lewin, and J. Cameron:—"We hereby certify that we have analysed the butter, and declare the results of our analysis to be as follows:—Water 12·05, curd 1·95, salt 0·96, fat 85·04 in the 100 parts. From a consideration of the results of a full analysis of the fat we are of opinion that the butter is genuine." The magistrate, Mr. Saunders, remarked that there had evidently been a lamentable miscarriage on the part of some of the Camberwell authorities, for a case of this kind was calculated to do much harm to a trader, inasmuch as the fact of his being prosecuted for selling an adulterated article became widely known, and though the fact of its being adulterated was afterwards publicly disclaimed, yet this disclaimer would not reach a tithe of the number who had heard of the charge against the trader. The defendant's solicitor, Mr. Chipperfield, assented to the magistrate's remarks, and stated that samples had on several previous occasions been taken from his client, which had always proved pure, whilst, in addition, a sample of lard, taken at the same time as the butter which was the subject of this case, had been found unadulterated. He should therefore ask that full costs be given. He further remarked that he had sent a sample of this same butter to Mr. Hehner, who had had considerable experience, and Mr. Hehner was then present, and would say that the butter was entirely pure. The Prosecuting Solicitor, Mr. Marsden: I shall ask for an adjournment that I may get the Government analyst here, because the certificate I have is equally strong. Mr. Saunders: This has been referred to Somerset House, the chief authority on the subject, and I can do nothing if you have these analysts here. Mr. Marsden: May I not be allowed to cross-examine the chemist who made this analysis? Mr. Saunders: No, I think not. Mr. Chipperfield: Mr. Hehner would show you, from the Public Analyst's own report alone, that the butter is pure. Mr. Saunders (to prosecuting solicitor): If you cross-examine them I could not do anything. I must take this certificate as conclusive, and that being so, it would be manifestly inconvenient in conducting public business to send a sample to Somerset House for analysis and then bring the analysts here to be cross-examined. You may be quite sure that the Somerset House authorities are the most efficient people, for they have to decide for the whole kingdom, and in most important cases. Mr. Chipperfield: Mr. Hehner reports:—"I have analysed the sample, and find it to contain 87·75 per cent. insoluble fatty acids. From this result it is obvious that the sample was free from foreign fat." And yet Dr. Bernays says that it contains 25 per cent. of foreign fat. Mr. Saunders: I think I ought to allow all reasonable costs, as great inconvenience has been caused to this man. I will say six guineas, I think. When traders act dishonestly I am always willing to punish them, but they ought fairly to be recouped their expenses when it is found that they have acted properly and fairly by the public. Six guineas for costs, and one guinea for the analyst you have brought here, will therefore be allowed.

**HEAVY FINES FOR MILK ADULTERATION.**—Robert Pike, a dairyman, of James Street, Excter, was summoned for having sold adulterated milk. Mr. G. H. Shorto appeared on behalf of the Town Council. The proceedings were taken under the Milk and Drugs Act of 1875. Mr. Shorto said a nominal penalty would not be considered adequate to meet the demands of justice. Mr. Lendon, Sanitary Inspector, said that on Thursday, the 7th September, he purchased three half pints of milk of the defendant's wife. On being tendered the milk witness informed her that he intended to have it analysed, whereupon she said she could not spare it. Witness, however, remarked that "he had got it," and left. Mr. F. P. Perkins, Public Analyst, said he had made an analysis. He found the milk to be diluted with over 25 per cent. of water. Defendant said he kept no cows himself, but bought his milk of Mr. Bricknell, a dairyman. Defendant called his wife, who bore out this statement. The Bench retired for a short time, and, on returning, the Chairman said the case had been carefully considered by the

magistrates, who regarded it as a very serious case. Milk was a necessary element in the food of invalids and children, who must be protected from such imposition. Defendant would therefore be fined in the lowest amount in such cases, viz., £5 and expenses (£1 2s. 9d.).—Samuel Bricknell, dairyman, of Holloway Street, was summoned for a similar offence. The evidence of Mr. F. Perkins showed that the milk supplied by the defendant was adulterated with water to the extent of 20 per cent., and a portion of the cream to the extent of 9 per cent. had also been removed. Mr. Fryer appeared for the defendant, and it appeared, in cross-examination, that the defendant was not present when the sample was taken, and that on the morning on which the milk was seized rain had fallen in torrents. Mr. Fryer contended that the case had not been made out, inasmuch as the Act of Parliament had not been complied with. The Act stated that the prosecutors should prove to the satisfaction of the justices that the defendant had had notice of the intended analysis and should accompany him to the analyst. He contended that inasmuch as the complainant gave the defendant no opportunity of accompanying him to the analyst, the Act had not been complied with. He also suggested that the water in the milk might be objected for by the heavy rains which fell during the time of milking. Mr. Shorto, replying to Mr. Fryer's objection, said the Act to which Mr. Fryer alluded had been repealed in 1875. Mr. George Henry Mugford, boot-maker, of Magdalen Street, and Mr. Mawrice Sewell, grocer, South Street, said they had dealt with the defendant for a number of years, and had never had cause for complaint. The Bench, after a brief consultation, fined the defendant £5 and the expenses. The Chairman said he hoped the present proceedings would be a warning to parties who were vendors of milk not to come before the magistrates.

**THE TIME LIMIT FOR SERVING SUMMONSES.**—At Clerkenwell Police Court, William Gunning, milk-vendor, of North Street, Pentonville, was summoned at the instance of the Vestry of Clerkenwell, to answer a complaint of having sold milk adulterated with water. Mr. Ricketts, solicitor, attended for the defence. From the evidence of Thain, one of the sanitary inspectors of Clerkenwell, it appeared that on the 30th June he purchased at the defendant's shop a pint of milk, for which he paid twopence. He told the person from whom he purchased the milk that he should take a third portion of it to Dr. Redwood to have it analysed. He did so, and the certified result of the analysis was that there was 30 per cent. of water added to the milk. He understood that defendant kept no cows, but got his milk from wholesale dealers. Mr. Ricketts, for the defence, said, had he gone on with the case, he should have been able to show that the defendant was not much to blame in the matter, but he had an objection to take to the summons which he thought would prove fatal to the proceeding, and would enable the magistrate to dismiss it. The milk was purchased on the 30th June, and these proceedings were not commenced in this Court until the 12th of August; consequently, under the Act to Amend the Sale of Food and Drugs Act, 1875, which received the Royal Assent and came into operation on the 21st of July of the present year, the whole proceeding must be quashed unless the hearing\* took place within 28 days of the day of purchase. Milk was a perishable article, and this was specially provided for in the amended Act. Mr. Hosack (the magistrate) pointed out that the milk in this case was purchased before the passing of the Amendment Act. Mr. Ricketts said that did not matter. The words of the 10th section of the amended Act were very plain, and were as follows:—"In all prosecutions under the principal Act, and notwithstanding the provisions of section 20 of the same Act, the summons to appear before the magistrate shall be served upon the person charged with violating the provisions of the said Act within a reasonable time, and, in case of a perishable article, not exceeding 28 days from the time of the purchase from such person for test purposes of the food or drug, for the sale of which in contravention to the terms of the principal Act the seller is rendered liable to prosecution, and the particulars of the offence or offences against the said Act, of which the seller is accused, and also the name of the prosecutor, shall be stated on the summons, and the summons shall not be made returnable in a less time than seven days from the day it is served upon the person summoned." That section made it clear that the magistrate could not convict, and therefore he had to ask for the dismissal of the summons. Mr. Hosack, having considered the section, at once dismissed the complaint.—David Edwards, of 230, St. John's Street, Clerkenwell, was likewise summoned for the committal of a like offence. Inspector Cheshire said in this case the milk was adulterated with 27 per cent. of water, but as he purchased the milk prior to the purchase of the milk in the other case, he would, with the permission of the magistrate, withdraw the summons. Mr. Hosack allowed that course to be adopted.—John Champion Kent, of 52, White Lion Street, Pentonville, was summoned for selling milk that was adulterated with 14 per cent. of water, but that summons was also withdrawn.

\* This is an error. As will be seen by the section quoted, the summons must be served within 28 days, not the hearing take place within that time.—[EDS. ANALYST.]



**ADULTERATED BUTTER CASE.**—At Clerkenwell Police Court, Thomas Jones, butterman, of 97, Lever Street, St. Luke's, was summoned by Mr. Edes, sanitary inspector, for having sold butter which was adulterated. Mrs. Robins, of Hull's Terrace, York Road, said that in accordance with instructions she had received from Mr. Edes, she went to the defendant's shop and purchased half-a-pound of butter, at 1s. 2d. per lb. After she had purchased it the sanitary inspector entered the shop and told the defendant he should have the butter analysed by the Public Analyst. The butter was not exposed in the window, and was brought by the defendant from a room behind the shop. The defendant said he had bought the butter from another person, and he did not know it was adulterated. Mr. Edes said the result of the analysis showed that the butter had been adulterated to the extent of 80 per cent. of fatty matter other than butter. The magistrate ordered the defendant to pay a fine of £3.

**HEAVY FINE.**—At the Police Court, Bath, John Crosswell, of 5, Bridge Place, Holloway, was summoned for having sold during last month a pint of new milk which was not of the quality and substance demanded. On the 25th ult. Inspector Montague visited defendant's house and asked for a pint of new milk for the purpose of having it analysed. He was supplied by the defendant with a pint of milk, for which the inspector gave him three half-pence. Mr. Gatehouse, Public Analyst, on analysing it, found that it contained 15 per cent. of water. In his defence defendant admitted selling the milk to the inspector, but stated that it was the last that remained of six quarts which he had purchased for another person. The magistrate fined defendant £10 and costs, or 14 day's imprisonment with hard labour. Defendant replied that he could not pay the amount as he had a wife and five children.

At the Marylebone Police Court, Joseph Mason, of 55, Weedington Road, Kentish Town, was summoned for selling a pint of milk, found on analysis to be adulterated with water. Mr. Ricketts prosecuted for the St. Pancras Vestry. It was stated that the defendant was in a small way of business, and that the sample, when analysed by Dr. Thomas Stevenson, the Public Analyst of St. Pancras, was found to be adulterated with added water to the extent of 17 per cent. The magistrate fined the defendant 10s. and 2s. costs.

At Stockton-on-Tees Borough Police Court, Anthony Watson was fined £5 and costs for selling adulterated milk, this being his fourth offence.

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### NOTES OF THE MONTH.

The great sensation of the month has been the Camberwell butter case, in which the analyst certified to the presence of 25 per cent. of foreign fat, while the chemists at Somerset House held the same article to be genuine. It is with regret that we refer to the matter at all, but, as journalists having the interests of accord among analysts at heart, we feel bound to point out one or two lamentable occurrences in the whole matter. No one for a moment will doubt but that Dr. Bernays gave the analysis his fullest care, and reported according to the best of his judgment, even if, unfortunately, this was faulty. The allegation of carelessness is certainly unfounded. We have been privately favoured with copies of both the reports—that of the analyst, and that of Somerset House. At first Dr. Bernays found the butter to contain :

Water admixed	..	..	..	..	..	12·37
„ free	..	..	..	..	..	3·00
Salt	..	..	..	..	..	1·24
Curd	..	..	..	..	..	0·20
Fat	..	..	..	..	..	83·19

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100·00

The "actual gravity" of the fat was ·911; melting point 43·5; and the insoluble fatty acids 88·31. Judging apparently by Hehmer's original standard, the analyst reported that the butter was presumably mixed with about 25 per cent. of foreign fat, but he did not consider it a sufficiently bad case for prosecution. Here, then, came error the first: for, this report having been submitted to a committee of the Camberwell Vestry, that body decided to prosecute in spite of the analyst's opinion that they ought

not to do so, and requested him to give another certificate without the saving clause, which he, unfortunately, did. Now it is evident, that, but for this undue interference of persons totally unskilled in analysis, or the interpretation of analytical results, the subsequent proceedings would not have occurred. We have looked most carefully through the Act, and nowhere do we find any warrant for a committee to sit in judgment on the analyst's certificates. We are aware that it is the general custom, but, it is in our opinion, in the highest degree undesirable. The secret of where the samples were bought, and the results of their examination, are only to be known (as we read the Act) to the inspector, and if he receive a certificate that the article is genuine, he must not take any further step; but if it be a mixture, and the analyst definitely declares it to be so, then he must forthwith proceed to take out a summons. It is, in the interests of traders, that analyses should not be communicated to persons who might themselves be business opponents, and who are therefore unfit to sit in judgment, lest they should use their position, as the analyst's employers, to coerce him to certify against an article when he has doubts of the advisability of doing so. On the other hand, persons may offend and be reported against, and yet, by this secret committee system, the proceedings might for some reason be stopped and the public made to suffer. The sooner, therefore, that vestries entirely give up this system of demanding all the certificates from the inspectors, to overhaul them in committee, the better, as it is not only unwarranted by the Act, but also renders the quarterly report of the analyst a mere farce, of telling men what they already know. The utmost that ought to be required is, that when the inspector receives a distinctly adverse certificate, he should mention the circumstance, and ask for the aid of the legal officers of the vestry as a matter of course. No committee can legally take any cognizance of the number and nature of the samples procured, and the results of their analyses, except upon the quarterly report of the analyst, duly provided for in the Act for their information, and which has to be sent by them, after they have considered it, to the Local Government Board. If Dr. Bernays had seen his way to definitely assert his true position, and refuse to alter anything at the bidding of a body who ought never even to have seen his certificate, he would have done good service, but, even as it is, he has probably done better, because, as it has turned out, the fallacy and illegality of the proceeding has been clearly manifest.

We sincerely wish we could have stopped here, but must now proceed to fault number two. It is evident, from Dr. Bernays using Muter's "actual gravity" process, that he had studied Muter's paper on "butter analysis," in the first number of THE ANALYST. It is a pity that he did not go farther, and adopt the limit therein laid down (which is, as far as we know, that now generally recognised), namely, to calculate the admixture on 87 per cent. insoluble acids (with the proper proportion of soluble acids), but to make no report against any sample under 89 per cent. insoluble with a proportionately low soluble. In that paper, the conclusions of which were subsequently verified by other observers, it was shown that perfectly genuine butter might, when very old and at certain seasons, yield nearly 89 per cent. insoluble acids, and, therefore, although in the Camberwell case some admixture of fat might be probable, it was not certain.

The Somerset House chemists found :

Water	..	..	..	..	..	..	12.05
Curd	..	..	..	..	..	..	1.95
Salt	..	..	..	..	..	..	.96
Fat	..	..	..	..	..	..	85.04
							100.00

We pass over the discrepancies of curd and salt which might always occur, owing to imperfect incorporation, but these gentlemen go on to say :—"From a consideration of the results of a full analysis of the fat, we are of opinion that the butter is genuine." Unfortunately we have not the figures of their full analysis of the fat, and, owing to the official secrecy affected as to their processes and standards, we have no real means of judging ; but, supposing they agreed in insoluble acids, &c., with Dr. Bernays, the perfectly safe report to have made, would have been that "it came within the possible limits of genuine butter." It is after all a great pity in the true interests of every one, both analysts, traders, and the public, that Mr. Bell and his colleagues were refused permission to publicly lay their processes and standards before our Society, so that we might fairly discuss and adopt them. It is true, that when individual analysts call at Somerset House, they receive the greatest courtesy, but the only way to avoid repetitions of the Camberwell case is, for the authorities to authorize the chemists at Somerset House to periodically and officially communicate to our Society their ideas as to standards, so that we may discuss them, and substitute perfect accord for occasional discord. Another lesson taught by the case is, that Public Analysts should attend the meetings and join in the discussions of our Society, from which Dr. Bernays was unfortunately compelled, by press of work, to resign some years ago. Had he been with us, and heard all that has been said among us as to butter, he would have adopted the 89 limit long ago, and saved himself much unmerited abuse and annoyance.

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Alluding to the statement made by Dr. Bernays before the Camberwell Vestry at the last meeting, the *South London Observer* says that : "The spectacle of several erudite members of the Vestry solemnly checking on their blotting paper the results of the conflicting analyses was sublime, and the value of the whole scientific twaddle indulged in during the discussion was admirably demonstrated by the fact that one learned commentator alluded to Dr. Bernays as the 'analysist,' and another refuted the notion of accepting as infallible that gentleman's 'ipsy dixy!'"

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In an article on this case, the *Grocer* gives the advice that traders should cause every analysis to be referred to Somerset House, in the hope, doubtless, that they would occasionally benefit by the lower standards adopted there than by some analysts. This is a proposal we would most cordially endorse, because it would definitely put an end to the abuse showered upon us, as a body, by certain trade organs. It would then be seen by the public, that our decisions would really be reversed in very few cases. Indeed, we are certain that nothing like so great a percentage of our opinions would be altered as is annually done on appeals in the Court of Chancery, and, when such a reversal did occur, no one would think more of it than they do of the reversal, on appeal, of the decision of a Vice-chancellor. That is a thing which happens almost

weekly, and yet the judges of the first instance are not abused; so why not accord to us the same amount of consideration? Is it to be held that we ought to be more infallible than a Vice-chancellor?

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The *Grocer* argues that the analyses done at Somerset House must be more trustworthy than those by Public Analysts, because the Government chemists have no desire to make "cases." This is, once more, the old, old story! Why on earth should any analyst desire to "make cases?" Neither his appointment, nor his remuneration, in any way depends on such a course. He is not the detective, and he does not even know from whence his samples come, and so what interest can he possibly have except simply to do his duty to the best of his ability? Indeed, if interest acted in any way, it would be in the direction of making as few cases as he could, and so saving the annoyance of attending police courts. That there should be a Court of Appeal in every matter is most desirable, and, no doubt, as science progresses, the differences of opinion will gradually disappear. Why do not the trade journals honestly admit that for one such difference there are plenty of agreements, and, instead of abusing the analysts, direct their pens to persuade tradesmen to act properly up to the Act, and openly label and sell their mixtures as mixtures, so saving both themselves and the analysts a world of trouble. There is, for instance, not a single case of chicory in coffee but might be avoided by a little simple honesty in labelling on the part of the retailer, but if men will sell without declaring they deserve no sympathy. The Act came upon the country at a time when not more than three men professed special attention to food analysis. One of them (the late Dr. Letheby) is dead, and only the other two still survive, and so both Public Analysts and the Somerset House Court of Appeal have had to really learn the special portion of their duties since the passing of the Act, and it is no wonder that things take some time to shake down into order. We venture to say, however, that no country in Europe now contains so many really experienced food experts as Great Britain, and the happy consummation of perfect uniformity would be forwarded if Mr. Bell and his colleagues were not compelled to wrap themselves up in an empirical state of mystery, but were permitted to behave as scientific men should in the nineteenth century, and to communicate their processes and standards to our Society, and so join in advancing the science of food analysis. To be in a position of originating processes and making discoveries, and yet to be debarred from laying their results before their fellow-workers is, indeed, an unenviable position for our *confreres* at Somerset House. Even when officially written to by Dr. Bernays for their limits for butter, so that he might know in future, they were not permitted to put a definite reply on paper, but had to give a vague answer, and offer to show him personally what they must not write. It is surely time that the Board of Inland Revenue saw their way to remove so childish an embargo on the publication of what would, doubtless, be the proofs of the ability of their scientific officers.

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Our readers will observe that some milk cases have been dismissed under the new Act, because the summonses were not served within twenty-eight days from the purchase of the samples. This important point should be kept in mind by the inspectors, and the law officers charged with prosecuting under the Act.

What do the censors of the famous self-constituted Institute of Chemistry say to the following? A would-be analyst, who puts F.I.C. after his signature, and whose name appears in the published list as one of the Fellows of the Institute, has been sending letters to food manufacturers something in the following style:—"I have been examining your products and find a large proportion of copper. I shall of course act under proper advice, but I am afraid there is no course open to me but to place the matter in the hands of the proper authorities." In one case the result of the letter was a request to analyse other samples, for which the would-be analyst charged a good round fee, *found copper in each case*, and was unfortunately paid. Similar samples were afterwards submitted to analysts of repute, who found either no copper at all, or the infinitesimal traces which are present in most organic substances. We can scarcely look upon this disinterested (?) work as anything short of a species of black mail. Thank goodness the man is not a Public Analyst. We can give the censors copies of several of the letters which we have seen, and shall be curious to see how these "elevators" of the profession of chemistry will act in the matter.

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Mr. John Parry has been appointed Public Analyst for the Borough of Penryn.

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#### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1879. No.	Name of Patentee.	Title of Patent.	Price.
189	A. H. Allen .. .. .	Treatment of Sulphurous Gases .. .. .	4d.
245	R. E. Crompton and J. W. Williams	Apparatus Employed in Electric Lighting .. .. .	2d.
259	T. W. Grieve .. .. .	Lamp or Apparatus for Shading Electric Light .. .. .	6d.
269	F. M. Lyte .. .. .	Separation of Metals from Metallic Ores by Treatment with Acids, Brine, &c. .. .. .	8d.
325	E. L. Paraire .. .. .	Electrical Light Apparatus .. .. .	2d.
416	J. D. Andrews.. .. .	Electric Lamps .. .. .	2d.
427	C. Dubos .. .. .	Electric Lamps .. .. .	4d.
461	G. Wheeler .. .. .	Manufacture of Citrate of Magnesia .. .. .	6d.
469	N. J. Heckmann .. .. .	Treatment of Paper and Parchment to detect Erasures	2d.
523	E. T. & W. R. Bousfield .. .. .	Electric Light .. .. .	6d.
594	E. G. Brewer .. .. .	Apparatus for Manufacture of Hydrogen Gas .. .. .	6d.
673	T. J. Smith .. .. .	Extracting Mucilage from Seaweed .. .. .	6d.
698	H. J. Smith .. .. .	Contrivance used in Processes Involving Formation, &c., of Chemical Compounds .. .. .	6d.
705	W. J. Strype .. .. .	Apparatus for Manufacture of Sulphuric Acid .. .. .	6d.
713	O. C. Ross .. .. .	Production of Sulphur .. .. .	4d.
778	J. C. Mewburn .. .. .	Apparatus for Cooling Fatty Acids .. .. .	6d.
863	C. D. Abel .. .. .	Electric Lamps. .. .. .	6d.

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#### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Boston Journal of Chemistry; The Provisioner; The American Dairyman; The Practitioner; American New Remedies; Proceedings of the American Chemical Society; Le Praticien; The Inventors' Record; New York Public Health; Philadelphia Printers' Circular.

# THE ANALYST.

NOVEMBER, 1879.

## SOCIETY OF PUBLIC ANALYSTS.

THE next Meeting of this Society will be held at Burlington House, Piccadilly, on Wednesday evening, the 19th November.

### ON THE OXIDATION OF SULPHUR IN GAS BY COMBUSTION.

By W. C. YOUNG, F.C.S.

IN No. 8 of THE ANALYST\* I published an account of some experiments, made for the purpose of ascertaining whether sulphurous or sulphuric acid was produced by the combustion of gas containing sulphur, the results of which led me to the conclusion that practically the whole of the sulphur present was converted immediately into sulphuric acid. This conclusion was afterwards borne out by Silliman and Sadler in a paper "on the volumetric determination of sulphur and ammonia in illuminating gas," which appeared in *The Journal of Gas Lighting*, vol. 29, p. 461, and subsequently by Heisch and Wigner in this journal.† Having this conviction, it seemed to me possible to absorb the acid fumes by passing the products of combustion over zinc in a fine state of division, by which means a very simple method of estimating the sulphur would be found as the difference in weight of the apparatus before or after use would be due solely to sulphuric acid. In attempting to put this into practice, I was surprised to find that the zinc was quite unaffected, except in places where moisture had condensed, and there sulphate had formed. I noticed, moreover, in the course of numerous experiments that wherever sulphate was, there also was carbonate to be found. This result casting some doubt on my former conclusions, I determined to investigate the subject farther, and avoid using any alkaline or basic substance as an absorbent of the acid. Accordingly, I first determined the amount of sulphuric acid contained in the water condensed in the gas referees' apparatus, used without carbonate of ammonia before and after oxidation with nitric acid, when I obtained an average of .5 grains of sulphur per 100 cubic feet consumed, but in no case did I find an increase when the liquor was boiled with nitric acid previous to precipitation. As it was possible that the condenser was too hot to admit of the absorption of the acid by the condensed water, I next caused a fine stream of water to flow on to the glass balls in the cylinder by means of a modification of Bischof's constant level apparatus, used in his method of water analysis. A drawing of this apparatus will be found in a paper, by me, printed in *The Journal of Gas Lighting*, vol. 29, p. 464. It consists of an inverted flask, the neck of which is fitted into a tube narrowed towards the end to a fine bore, and fitted near its extremity with a stop-cock; on to this tube is blown at right angles another tube bent up again so as to be parallel with the former, and furnished near the top with a stop-cock. To use this apparatus, the flask is filled and the tube fitted firmly into its neck, the whole inverted and the lower stop-cock opened; when the flow of water ceases the delivery can be regulated to any desired rate by means of the upper stop-cock.

\* Vol. I., p. 43.

† Vol. III., pp. 133, 138.

The following results were obtained in this way :—

	Sulphur condensed as H <sub>2</sub> SO <sub>4</sub> in grains per 100 cubic feet of gas consumed.				Total Sulphur in gas in grains per 100 cubic feet.			
1.	..	..	..	·90	..	..	..	12·9
2.	..	..	..	·65	..	..	..	14·8
3.	..	..	..	·80	..	..	..	11·9
4.	..	..	..	1·26	..	..	..	12·8
5.	..	..	..	1·26	..	..	..	15·4
6.	..	..	..	1·31	..	..	..	14·6
7.	..	..	..	1·53	..	..	..	12·7
8.	..	..	..	·98	..	..	..	13·2

It seems, therefore, that either by using a larger quantity of water, or by cooling the cylinder, the amount of sulphuric acid condensed was somewhat increased but not to the extent expected, as fully half the space in the cylinder was kept quite cool during the progress of the experiment. This experiment was varied by carrying the end of the eduction tube of the referees' apparatus into the neck of another cylinder, on to the glass balls in which the water was run, so that the condensing power of the apparatus was vastly increased whilst using the same quantity of water as before.

The results thus obtained are as follows :—

	Sulphur condensed as H <sub>2</sub> SO <sub>4</sub> in grains per 100 cubic feet of gas consumed.				Total Sulphur in gas in grains per 100 cubic feet.			
1.	..	..	..	1·02	..	..	..	12·8
2.	..	..	..	1·01	..	..	..	16·1

A second estimation of the sulphur in the liquor obtained in these experiments was made after oxidation, but no increase was obtained. It was clear, therefore, that the means adopted were inadequate for the purpose of the complete absorption of the sulphur acids formed, but it seemed to me that if only sulphuric were formed these means were competent to arrest it; and to assure the presence of that acid only, I substituted bromine water for the water, using only one condenser, when the following results were obtained :—

	Sulphur in grains per 100 cubic feet of gas consumed.				Total Sulphur in gas in grains per 100 cubic feet.			
1.	..	..	..	8·28	..	..	..	13·8
2.	..	..	..	5·20	..	..	..	12·4
3.	..	..	..	8·22	..	..	..	13·1

In these experiments the sulphur obtained as sulphuric acid increased with the bromine water employed, which in the last one was a saturated solution; as, however, a considerable portion of the sulphur had escaped condensation, a trial was made with the double apparatus before described, substituting bromine water for the water, when very similar results were obtained, as will be seen below :—

	Sulphur obtained in grains per 100 cubic feet of gas consumed.				Total Sulphur in grains per 100 cubic feet of gas.			
1.	..	..	..	7·25	..	..	..	10·80
2.	..	..	..	7·32	..	..	..	9·48

It being evident that sulphuric acid could be absorbed from the mixture of gases by means of water, the inference drawn from the failure to obtain the whole of the sulphur was that the remainder escaped in the form of sulphurous acid, the means employed not being sufficient to oxidise the whole; accordingly I again varied the experiment by placing bromine under water beneath the burner, dispensing with the dripping apparatus, and substituting a reservoir of bromine under water in the upper cylinder, formed by removing the tube in the bottom and plugging the hole.

In this way I obtained more sulphur in the form of sulphuric acid, per 100 cubic feet of gas consumed, than was given by the method employed for estimating the total quantity of that impurity in the gas, as will be seen below :—

Sulphur as H <sub>2</sub> SO <sub>4</sub> found by experiment as above described in gas per 100 cubic feet of gas.				Total Sulphur in gas by "Referees" method in gas per 100 cubic feet.			
1.	..	..	14.2	..	..	..	12.5
2.	..	..	13.8	..	..	..	12.4
3.	..	..	12.5	..	..	..	11.3

As some of the sulphur obtained may have been derived from the vulcanized rubber connections employed in these experiments they were repeated, cork being substituted for the rubber, when the results obtained were practically the same as those given by the usual method of estimating the sulphur.

Repeat of last experiment, cork connections substituted for vulcanized rubber :—

Sulphur as H <sub>2</sub> SO <sub>4</sub> in grains per 100 cubic feet.				Sulphur by "Referees" method in grains per 100 cubic feet.			
1	..	..	13.00	..	..	..	13.4
2.	..	..	9.28	..	..	..	9.2
3.	..	..	13.20	..	..	..	13.3

These results show beyond doubt that sulphurous acid only is formed when gas is burned in a Bunsen burner under the "Gas Referees'" apparatus, as the small quantity condensed as sulphuric acid by water alone may reasonably be assumed to have been oxidised during its passage through the apparatus. It is remarkable, however, that in all the experiments I have made where alkali or alkaline carbonate was used as the absorbent no trace of sulphite could be detected; that sulphurous acid cannot be detected in the water condensed in the cylinder, by the ordinary tests, and that when the cylinder is packed with zinc, or copper turnings, the whole of the sulphur is arrested, the resulting compound being invariably sulphate, and especially so in face of the circumstances that the air in the apparatus was formed to contain, on an average, only 12 per cent. of oxygen when the gas was burning at the rate employed, which was .5 cubic feet per hour; but if any doubt could have remained as to the power of the current of hot air to oxidise the alkaline and other sulphites formed (by the action of sulphurous acid on carbonate of zinc or copper), the result of the following experiment must have entirely removed it. An alkaline solution of sulphite of soda, containing the equivalent of 5 per cent. of sulphur, was slowly run on to the glass balls in the cylinder of a Gas Referees' sulphur apparatus, the flame of a small spirit lamp being employed in the place of a Bunsen burner to produce the current of air, when it was found that the whole of the sulphite was oxidised into sulphate before it reached the bottom of the apparatus.

### SOME OBSERVATIONS ON THE IODIC ACID TEST FOR MORPHIA.

(Abstract of Paper by DR. DUPRÉ, from Guy's Hospital Reports, of 1863).

*Test solution employed*—Iodic acid, 1 part in 15 parts water; starch, 5 grains boiled with 2,000 grains of water; ammonia, ordinary strength as used in testing, and the same diluted about 50 times.

Solutions of morphia or its salts, as nearly neutral as possible, give a yellow colouration, on addition of iodic acid; a tint is still perceptible when 1 part of morphia



is present in 20,000 parts of solution. As long as the dilution is not greater than 1 in 600, a blue colouration is produced on addition of starch; below this strength the production of the blue becomes uncertain, and it fails altogether to make its appearance if the dilution exceeds 1 in 1,000. In the case of ordinary reducing agents, the blue iodide of starch is produced, even if they are so diluted that the yellow colouration, due to the iodine liberated from the iodic acid, is no longer perceptible. If to the mixture of iodic acid and morphia solutions an excess of ammonia is added, the yellow colouration produced by the iodic acid is, as shown by Lefort, considerably increased in intensity, and the colouration may, under these conditions, still be perceived in solutions holding no more than 1 part of morphia in 30,000 parts of solution. The colouration produced in ordinary reducing agents is discharged by ammonia. As stated above, mixtures of iodic acid and morphia, containing less than 1 part of morphia in 1,000 parts, no longer become blue on addition of starch. If, however, a very dilute solution of ammonia be carefully poured on to the surface of this mixture, which is best done by means of a fine pipette, two coloured rings make their appearance at the junction of the two fluids. A blue ring becomes visible in the lower acid layer, and a brown one in the upper alkaline portion; when the two layers are mixed the whole assumes a brownish colour. In this way the blue ring may be made visible in solutions containing only 1 part of morphia in 20,000 parts of solution. If a drop of the mixture of morphia and starch is carefully evaporated on a piece of white porcelain, and the dry spot, after cooling, is moistened with iodic acid, as little as 1-20,000th grain of morphia may be recognised by the blue colouration produced.

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\* THE NON-EXISTENCE OF NASCENT HYDROGEN.

By DR. DONATTO TOMMOSI.

THE author has proved by very ingenious experiments that the so-called nascent hydrogen does not differ in any respect from ordinary hydrogen. Of the various experiments we will mention the most important.

1. A solution of chlorate of potash was treated for some time with sodium amalgam. The liquid was then neutralized with nitric acid and tested for chlorine with nitrate of silver, but no chloride of silver was produced, showing the nascent hydrogen does not reduce the chlorate.

2. The experiment was repeated, but this time with constant addition of some acetic acid to keep the liquid slightly acid. After six hours the liquid was tested with nitrate of silver, and found to be free from chlorine.

3. A saturated solution of potassium chlorate was acidulated with sulphuric acid and divided into two parts. The one was treated with zinc and the other with sodium amalgam. The fluids were both filtered before the free acid was neutralized. They were then both tested for chlorine. The one treated with the sodium did not precipitate with the silver, but the other gave a copious precipitate. It may now, perhaps, be thought the reduction of the chlorate was due to the nascent hydrogen evolved by the action of the zinc on the sulphuric acid, but the following experiment proves the reduction may be due, partly at least, to the zinc alone.

A very weak solution was so slightly acidulated with sulphuric acid as scarcely to act upon zinc. This solution was put into a U tube and decomposed by a galvanic battery, composed of eight Bunsen elements. The negative electrode consisted of platinum foil; the positive one of zinc foil. After two hours a little of the liquid (zinc side) was tested for chlorine, and it gave copious precipitate with silver, the other (platinum side) did not contain a trace. So from the experiment it appears that even electrolytic hydrogen does not reduce the chlorate, but the reduction was caused by the zinc. In order to prove this still more conclusively the experiment was repeated with a platinum electrode instead of the zinc one, and no trace of chloride was produced even after 20 hours.

The author found it impossible to reduce perchlorate of potash with so-called nascent hydrogen prepared by any of the known methods.

Whenever so-called nascent hydrogen reduces, it is because it happens to be accompanied by a sufficient amount of heat evolved during the chemical action of the substances which yield the hydrogen, but not because it possesses other properties than ordinary hydrogen. The author also considers it highly improbable the nascent hydrogen should consist of isolated atoms of H.

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#### GAS REGULATORS.

A NEW form of gas regulator, or governor, originally designed merely for application to street lamps, has been brought under our notice. It appears to possess special advantages for laboratory use in the perfection with which it regulates the supply of gas under varying pressures.

The inventor, Mr. Borrodaile, has discarded the ordinary flexible diaphragm, and constructs the governor entirely of metal. For sizes constructed to pass five feet or less per hour, the apparatus consists of a small brass cell carefully turned inside. The diameter of the cell is nearly that of an ordinary shilling, and it is about one-third of an inch deep. The inlet and outlet pipes for the gas pass into the top and bottom of the cell. The only movable part is a thin flat metallic disc, turned so as to fit the cell accurately, though loosely enough to vibrate freely. This disc carries a short metallic tube about a quarter of an inch long, which serves as a guide to ensure the parallel motion of the disc, and also as the tube through which the gas passes from the lower part of the cell to the upper. The regulation is effected by the rising or falling of the disc. When the pressure rises, this disc, carrying with it the metallic tube through which the gas passes, rises also, and by bringing the end of the tube nearer to a fixed plate, partially cuts off the supply of gas, similarly, when the pressure is diminished, the plate falls and the gas way is increased.

Simple as the invention is, it works better than the ordinary governors, as the following experiments will show.

Three burners, nominally four feet, were attached to the same pipe, under a gas pressure of 9-10ths of an inch. The consumption of the three was 11.7 feet per hour, or an average of 8.9. The gas pressure was suddenly increased to 19-10ths, and it was impossible to detect any difference in the illuminating power.

One governor with burner attached was tested separately.

Under a pressure of 9-10ths inch it passed 3·87 C.F. per hour.

" " 19-10ths " " 3·82 "

The orifice of the burner (an ordinary batswing jet) was reduced to less than half its area by putting a thick piece of paper in the slit.

Under a pressure of 9-10ths inch it passed 3·85 C.F. per hour.

" " 19-10ths " " 3·80 "

A test was made another day at higher pressures, and the following results were obtained:—

Under pressure of 9-10ths, a burner passed 3·80 C.F. per hour.

" " 30-10ths, " " 3·70 "

" " 50-10ths, " " 3·67 "

Another governor, made to pass more than 30 cubic feet per hour, was connected with four of the largest-sized Bunsen burners and used to heat a steam bath. Under a pressure of 19-10ths the consumption was, when all four burners were turned on, 33-ft. per hour; when only one burner was turned on, 32·5-ft. per hour. We have been using it very successfully for regulating the supply of gas to air drying baths, and are testing it for regulating the currents of air in gas washing experiments.

It will be found valuable in the laboratory in many other ways.

## SPECIFIC GRAVITIES OF FATS, RESINS, ETC.

By DR. H. HAGER.

The author first describes a simple method for determining these specific gravities. This consists in melting the respective fat, dropping it into a flat-bottomed vessel containing alcohol, in such a manner that the point from which the drops are allowed to fall is not over three centimetres distant from the surface of the alcohol, and that each drop be allowed to fall on a different spot. The fat globules thus deposited at the bottom are then removed to a liquid, consisting of either alcohol, water or glycerin, or mixtures of these, until after careful stirring and reduction or increase of the density, by the addition of one or another of the above liquids, the fat globules are held in equilibrium in any part of the liquid. The specific gravity of the latter is then determined, and this is, of course, at the same time the specific gravity of the fat. The author then gives a list of specific gravities, which is here reproduced:—

	Sp. gr. at 15—16° C.
Butter Fat, clarified by settling .. .. .	0·938—0·940
" " several months old .. .. .	0·936—0·937
Artificial Butter .. .. .	0·924—0·930
Hog's Lard, fresh .. .. .	0·931—0·932
" " old .. .. .	0·940—0·942
Beef Tallow .. .. .	0·925—0·929
Sheep's Tallow .. .. .	0·937—0·040
Beef and Sheep's Tallow, mixed 1:1 .. .. .	0·936—0·938
Butter of Cacao, fresh .. .. .	0·950—0·952
" " very old .. .. .	0·945—0·946
" and Beef Tallow, mixed 1:1 .. .. .	0·938—0·939
Expressed Oil of Nutmegs .. .. .	1·016—1·018
" " " extracted with carbon disulphide .. .. .	1·014—1·015
" " " adulterated with fatty acids .. .. .	1·010—1·011

	Sp. gr. at 15—16° C.
Expressed Oil of Nutmegs, crystalline .. .. .	0-965—0-966
Stearic Acid, melted and in drops .. .. .	0-964
"  "  crystalline .. .. .	0-967—0-969
Wax, yellow .. .. .	0-959—0-962
"  African .. .. .	0-960
"  yellow and resin, mixed 1:1 .. .. .	0-973—0-976
"  "  and paraffin, mixed 1:1 .. .. .	0-916—0-919
"  "  "  yellow ceresin, mixed 2:1 .. .. .	0-942—0-943
Ceresin, yellow .. .. .	0-925—0-928
Wax, Japan .. .. .	0-977—0-978
"  "  very old .. .. .	0-968—0-970
"  white, very old and true .. .. .	0-963—0-964
"  "  new .. .. .	0-916—0-925
"  "  "  and stearic acid, mixed 1:1 .. .. .	0-945
Wax, sp. gr. 0-963 and stearic acid, sp. gr. 0-963 mixed 1:1 .. .. .	0-975
Ceresin, very white, pure .. .. .	0-905—0-908
"  white .. .. .	0-923—0-924
Araucaria Wax .. .. .	0-990
Resin (fr. pine), yellow transparent .. .. .	1-083—1-084
"  whitish, opaque .. .. .	1-044—1-047
"  very dark colophony .. .. .	1-100
Shellac, light coloured .. .. .	1-113—1-114
"  darker .. .. .	1-123
"  bleached .. .. .	0-965—0-968
Dammar, old .. .. .	1-075
Copal, East Indian .. .. .	1-063—1-070
"  West Indian .. .. .	1-070—1-800
"  very old .. .. .	1-054—1-055
Benzoin, Siam .. .. .	1-235
"  Penang .. .. .	1-145—1-155
"  Borneo .. .. .	1-165—1-170
Guaiac Resin, pure .. .. .	1-236—1-237
Amber .. .. .	1-074—1-094
Sandarac .. .. .	1-038—1-044
Mastic .. .. .	1-056—1-060
Balsam of Tolu, old brittle .. .. .	1-231—1-232
(Kamala .. .. .	1-115—1-120)
(Lycopodium .. .. .	1-016—1-020)

Many of these figures may be used as criteria for distinguishing the various bodies.—*New Remedies.*

#### ALUM IN BAKING POWDER.

In a recent issue of the *Scientific American Supplement* will be found a communication from G. E. Patrick, Professor of Chemistry in the University of Kansas, giving details of a series of practical tests to determine whether the hydrate of alumina is dissolved by the gastric juice. The question has a vital bearing on the discussion as to the safety of using alum in baking powders. Professor Patrick attacks it without prejudice, by strictly scientific methods, and arrives at results which are certainly gratifying in view of the wide use of alum powders in our kitchens.

Professor Patrick takes his text from the published opinion of a prominent physician who says, after stating the difficulties attending a thorough mixture of the ingredients of alum baking powders:—"But even if the exact proportions were maintained, the

salts formed would retain their injurious properties, as they would dissolve in the gastric juice. The gastric juice contains not only lactic acid, but a large amount of hydrochloric acid, and both the sulphate and hydrate of alumina would be dissolved."

After testing by reference to authorities the statement that the gastric juice contains a large amount of hydrochloric acid, and finding the weight of evidence to be that the quantity is in reality extremely minute, and that little not free, Professor Patrick proceeds to describe his examination of the practical question whether the hydrate of alumina as it exists in bread after baking, when made with alum powders, will be dissolved in the fluids of the alimentary canal.

This question could be determined only by careful tests with living animals. Professor Patrick found cats to be most available. Having made biscuits with an acknowledged alum baking powder, using twelve times the proportion of powder directed on the labels, and employing for each experiment a distinct sample of powder, he fed the biscuits to cats that had fasted from one to two days. The amount eaten in each case was enough to give at least half a teaspoonful of powder to each experiment. After allowing for digestion 20 minutes, 45 minutes, 1½ hours, 2 hours, and 2½ hours, respectively, the cats were killed, and the contents of the stomach and small intestines were carefully examined for dissolved alumina. In each case undissolved hydrate of alumina was found, but of dissolved alumina there was never a trace.

Surprised at the uniformity of these results, and thinking that the organic matter of the flour might have interfered with the solution of the alumina or his detection of it, Professor Patrick made two crucial experiments. In each, two teaspoonfuls of the powder were mixed with water and baked at the ordinary temperature of the oven. The mass was then fed to a cat (under compulsion) and after a specified time the stomach and intestines were examined as before. In neither case was a trace of dissolved alumina discovered.

Similar experiments were then tried with unbaked (gelatinous) hydrate of alumina, and in these cases a trace of dissolved alumina was found; the inference being that it is not safe to eat dough made with alum powder—it should always be baked. Another important practical point was also suggested—namely, that if bread is carelessly mixed or with insufficient water, some of the powder may remain dry and the alum not changed to the hydrate; in which case the effect would probably be injurious.

In order to test this question, and also to furnish a check on the other experiments with biscuits, Professor Patrick had a batch made in which the mixing was less thorough than usual and with less water. These were fed to cats, and subsequent tests developed in every case a trace of dissolved alumina. These experiments, while proving the reliability of those first described, go to show, Professor Patrick thinks, that to insure the entire absence of alum in the bread, the mixing must be done with plenty of water. As a simple precaution it might be well to mix the batter too-thin at first, and stiffen it by the addition of pure flour.\*—*New Remedies*.

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Mr. J. Baynes has been appointed Public Analyst for the Borough of Boston.

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\* We do not find, however, that Professor Patrick's experiments contain any reference to the effects which might be produced by the insoluble alumina.—[Eds. ANALYST.]

## A NEW METHOD OF PREPARING SULPHURETTED HYDROGEN.

By J. FLETCHER, F.C.S., London and Paris.

ANY mode by which the preparation of this useful gas can be rendered easier, and the unpleasantness of its manipulation diminished, will no doubt be welcomed by analysts: I therefore make no apology for submitting the results of some experiments made after reading a suggestion in some of the scientific journals, perhaps your own, but the name does not at the moment occur to me.

The plan is simply to fuse in a small glass flask sulphur and solid paraffin, leading the resulting gas by means of a perforated cork, india-rubber, and glass tube directly into the solution to be tested. The first gases are not sulphuretted, but when the mixture has been thoroughly fused and mixed the sulphuretted hydrogen passes over abundantly.

The advantage of the process is that the moment the flame of the lamp is removed the evolution of gas ceases, and the little apparatus can be laid aside without fear of creating offensive smells. When used again, the gas passes at once when sufficiently heated.

A washing bottle seems unnecessary. I passed the gas for an hour through such a bottle, and the water, although most strongly impregnated with the gas, was fairly clear and limpid, showing only the usual appearances.

There are a few precautions to be taken. The mixture is inclined to bump when strongly heated, but a few pieces of broken tobacco-pipe shank prevent that. Care must be taken that when the lamp is removed, and the gas ceases to pass, that none of the solution is sucked back into the bulb; it is very easily prevented. A very strong heat should not be applied, as then distillations would commence and the product condense in the tube.

I believe the process to be a simple, cleanly, and elegant substitute for the old methods, and particularly well suited for small and private laboratories. How it would work in large ones I would like to hear from those who are in a position to try it.—  
*Chemical News.*

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Referring to the above note the following letter has appeared in the *Chemical News* :—

TO THE EDITOR OF "THE CHEMICAL NEWS."

SIR,—In the *Chemical News*, vol. xl., p. 154, Mr. J. Fletcher has described what he calls a new process for the preparation of  $H_2S$  by melting sulphur and solid paraffin together. Allow me to state that the process is not new, having been used by myself and others as far back as 1872. I continued to use it for more than twelve months, but found it very unsatisfactory, because of its explosive qualities, and upon that account gave it up. As far as I remember an explosion took place about every seventh experiment; at one time the cork of a flask would be violently ejected and the contents sent to the ceiling, at other times the flask was completely destroyed.

The process works remarkably well except for this one fault, and if Mr. Fletcher has succeeded in overcoming its explosive qualities by the addition of broken tobacco-pipe shanks he has indeed rendered a service to chemists in general.

I am, &c.,

WILLIAM JOHNSTONE, F.I.C., F.C.S.

Wiesbaden, September 29th, 1879.

## CORRESPONDENCE.

[The Editors are not responsible for the opinions of their Correspondents.]

TO THE EDITOR OF "THE ANALYST."

SIR,—If we are to believe some of our would-be teachers, there are—to paraphrase one of Carlyle's well-known sayings—in these islands about a hundred Public Analysts—mostly fools.

Under these melancholy circumstances, the Pharmaceutical Society has apparently undertaken the task, through its paid professors and editor, of educating us for our work. Unfortunately, no doubt owing to my belonging to the majority, I often fail to understand either the chemistry, the sense, or the morality of the teaching. Can any one belonging to the minority enlighten me?

In the *Pharmaceutical Journal* for September 27th, I find Dr. Paul reported as stating in evidence, that "the presence of tartrate of lime in cream of tartar was indicated by the *British Pharmacopœia*;" and in an editorial article in the same number it is said, that the fact that tartrate of lime is a natural ingredient of cream of tartar is recognised in the *British Pharmacopœia*. Now, bearing in mind that the evidence was given in defence of a person accused of having sold cream of tartar adulterated with 11.7 per cent. of tartrate of lime, I turn to my *British Pharmacopœia*, and what do I find? That the presence of traces of a calcium salt, not specially of tartrate of lime, in cream of tartar is recognised, and that traces only are meant, is placed, as I read the book, beyond a doubt, by both the qualitative and the quantitative test given. Professor Redwood's letter on this subject is, I must confess, beyond my powers of understanding; but it requires I suppose the highly-trained intellect of a pharmaceutical chemist for its comprehension.

In the number for October 18th, I find among other the following evidence of Professor Atfield reported. "There was enough soda to warrant the name—it was about  $\frac{1}{2}$  of a grain." "On account of the rapidity of the manipulation of the work by the boy in putting the soda into the bottles, I should certainly expect the quantity to vary from say  $\frac{1}{2}$  of a grain to 3 or 4 grains." Why not from nothing to—? No doubt the poor milkman is often punished, because in his hurry he has merely forgotten to empty his can of the water he used in washing it; and the poor grocer because he has ground first chicory and then coffee in the same mill, and has simply forgotten to clean it between the operations, &c., &c. "The soda dropped into one of the bottles falls on the glass ball, sometimes partly, sometimes mainly; and then, when the water charged with gas is driven by the machine into the bottle, air and gas escape from the neck of the bottle, and with that air nearly always comes out some spray, and with that spray might come a certain amount of soda." What may not have been carried away by that spray? "I then pressed down the ball and got out the liquid, and found lead therein. I immediately examined the particles of wax for lead, and found lead in considerable quantity." Astonishing! When asked, "Do you consider the lead in the sample innocuous?"—he answers, "Perfectly; such a minute quantity must be." Would Professor Atfield be kind enough to give us the exact composition of the residue left by this sample of soda water; and also the method which enabled him to state, positively, that the water contained about a  $\frac{1}{2}$  of a grain of added soda per bottle? Also, would he inform us whether, in his analyses and reports on potable water, he considers 1-20th of a grain of lead per gallon as necessarily innocuous?

In the same number (18) the certificate of the analyst is given, in which it is stated:—"This sample is ordinary water charged with carbonic acid gas, and does not contain added bicarbonate of soda, and is not soda water." In his evidence, Mr. Thomas is reported to have stated in answer to the question: "Supposing it contains only 3 grains?"—"It would still be soda water." But what says the editorial article? "The Newport analyst followed the example of many of his brethren in arriving at the conclusion that the *British Pharmacopœia* furnished a standard for the composition of soda water,—that if it did not contain in the half-pint 15 grains of carbonate of soda, it was not of the nature and quality of 'soda water.'" But enough for the present; and, in conclusion, I would only ask: Are we to accept such teaching as the above? Are pharmaceutical chemists trained in this way to supplant the too often incompetent Public Analyst?"—*vide* Professor Tilden's speech before the Pharmaceutical Society, October 1st, 1879; and, finally, does the Council of the Pharmaceutical Society sanction and approve this kind of teaching?

Yours truly,

A. DUPRE.

## THE IODIC ACID TEST FOR MORPHIA.

TO THE EDITOR OF "THE ANALYST."

SIR,—When writing a note upon the above last month, I find I was mistaken. I was under the impression that ammonia was to be added to the bisulphide of carbon containing the dissolved iodine; instead of that, the ammonia is to be added to the iodic acid and morphia.

Dr. Dupré kindly called my attention to the error which I had fallen into, and also referred me to a paper which he had published upon this subject some years since, no notice of which I believe has been taken in any of our text books. I have been carefully over his paper and the results are as stated.

I consider Dr. Dupré's paper a model of clear statement; one cannot well fall into error with such a guide; it would be well if our text books on analytical chemistry were as clear.

Yours truly,

J. CARTER BELL.

## ANALYSTS' REPORTS.

Mr. Wigner reports to the Plumstead Board of Works as follows:—"During the quarter I have examined 34 samples; only three of these were adulterated. The adulterated samples were all milk, and contained 7, 15 and 15 per cent. respectively of added water. Two samples of butter were of very inferior quality though not adulterated. The milk supply still continues unsatisfactory; three samples is a very large percentage out of 10 to be adulterated, bearing in mind that this adulteration is calculated in every case on a very lenient standard." Reviewing the results of the last six years, he says:—"The total number of samples purchased by the Inspectors and submitted to me during that time has been 801, of which no less than 90, or 11.2 per cent. have been adulterated. The samples of adulterated milk were 53 in number, or 59 per cent. of the total. Groceries, including tea, coffee, mustard, cocoa, &c., and butter were 23, or almost exactly one-fourth of the total number. There were five samples of adulterated bread, and nine of adulterated spirits. The percentage of adulteration found in the six consecutive years have been as follows:—1874, 14½ per cent.; 1875, 11 per cent.; 1876, 6½ per cent.; 1877, 9 per cent.; 1878, 16½ per cent.; 1879, 7½ per cent. The only way in which I can account for the remarkable increase shown in the figures for 1878 is, by supposing that the difficulties which had occurred in prosecution, owing to a misinterpretation of the Act, rendered dealers less cautious."

At the monthly meeting of the Salford Town Council, the Public Analyst (Mr. J. Carter Bell) presented the following report:—"During the quarter ending September 30, I have examined 140 samples, consisting of 120 of milk, 15 of butter, 2 of flour, 1 of tea, 1 of sweets, and 1 of port wine. Of these 32 were adulterated, consisting of 28 of milk, 3 of butter, and one of wine. It will be noticed that milk adulteration has increased, nearly 25 per cent. of the samples having been adulterated. Much has been written in the papers lately upon the manner in which samples of milk are taken. It has been proposed that the adulterated milk should be traced to the guilty party, and this was suggested as a novelty at the last meeting of the British Association, whereas it has for a long time been my practice to track out the real culprit. Thus in Salford, whenever a sample of milk is found to be adulterated, the inspector at once inquires whence the vendor obtains the milk. A sample is then procured from the wholesale dealer, and if that is found to have been tampered with, the inspector obtains samples from the cans of the farmer who supplies the milk immediately on its arrival in Salford. If this corresponds to the former samples, I then make a point of seeing the cows milked myself, and analyse the sample which has been obtained in my presence, so as to leave no chance of an innocent person being convicted. The inspector spares no pains or trouble in finding out the real delinquent. He has taken several samples on Sunday, when the milkman thought he was in church. One of the samples of milk obtained on that day contained as much as 35 per cent. of water. The sample sold as port wine contained more spirit than any sample I have previously examined or found in any published analyses. It also contained more cream of tartar, tartaric acid, and sugar, and the colouring matter was artificial. Taking all these facts into consideration it is my opinion that this so-called wine is perfectly innocent of the juice of the grape.

The Cheshire Analyst (Mr. Carter Bell) reported to the Quarter Sessions that he had examined during the quarter 123 samples, including 62 milks, 4 tobaccos, three lards, 6 coffees, 2 peppers, 1 butter, 1 mustard, 1 cocoa, 1 cheese, 1 flour, 2 oatmeals, 9 teas, and 2 breads; the remainder consisting of water and alcoholic drinks. Eleven samples were adulterated, viz., 8 milks, 1 butter, 1 gin, and 1 cocoa.



At the Devon Sessions, the County Analyst (Mr. A. Blyth) reported that during the quarter he had examined thirteen specimens of food, and had found but one case of adulteration, namely, that of an admixture of chicory with coffee.

### LAW REPORTS.

**NOTICE AS TO MIXTURE.**—At the Salford Police Court, William Hampson, milk dealer, West George Street, was summoned for selling adulterated milk. Mr. Walker prosecuted on behalf of the Corporation, and Mr. Gardner appeared for the defendant. Mr. Walker stated that on the 29th July a boy named Thompson, son of the inspector under the Sale of Food and Drugs Act, visited the defendant's shop and asked for a pint of new milk. He was supplied by the defendant, and paid 1½d. for it. After having purchased it, he told the defendant that he had bought it for the purpose of having it analysed, and the defendant in reply directed his attention to a card which was hanging up in the shop upon which were the printed words, "This milk is sold as a mixture of milk and water." The boy then took the milk to his father, who was outside waiting for him. He (Mr. Walker) presumed that the defendant was alive to the offence, inasmuch as he had the card hung up stating that he was selling a composition of milk and water. The 8th section of the Sale of Food and Drugs Act only protected persons in cases where the addition of any compound was not made for the purpose of fraudulently increasing its quantity. The addition of water was not necessary for the sale of the milk, and it could only be made for the purpose of increasing the quantity of the milk. The above facts having been corroborated by Inspector Thompson and his son, Mr. Makinson remarked that the inspector's son knew he was purchasing milk and water, and therefore he was not prejudiced. The boy was an agent to all intents and purposes, and knew that he was going to receive milk and water. Mr. Walker submitted that the boy was an independent person. Mr. Makinson took an opposite view, and elicited from the inspector that he gave his son the money to pay for the milk. He (Mr. Makinson) thought it was just possible that the notice hanging in the shop—a rather dark room—was not sufficient to enable everyone to see that a mixture of milk and water was being sold. According to the evidence the defendant did not notify to the inspector's son that the card was there until the latter informed him that he was buying the milk to have it analysed, and he (Mr. Makinson) was, therefore, of opinion that the card was not a proper notice to everyone going into the shop to buy milk. When a man chose to carry on a trade in a risky manner as the defendant had done, he ought to tell everybody—any new customer—going into the shop that he sold milk and water if milk was asked for. In the present case, however, the inspector's son knew that what he was buying was milk and water. The summons was dismissed. Mr. Gardner: I may say now that he told the boy, and we tell every customer, that we sell milk and water. Alfred Riley, provision dealer, Paradise Street, Salford, was summoned for a similar offence. Inspector Thompson stated that on the 5th August he called at the defendant's shop and bought a pint of milk for which he paid 1½d. He divided it into three parts, and sent one part to the Public Analyst for analysis. Mr. Carter Bell Public Analyst, said he had examined the milk referred to, and found it contained 10 per cent. of water. The defendant's plea was that he sold the milk in the same condition as it was when he bought it. Mr. Makinson said the defendant was bound to know that the milk he sold was good milk, and fined him 5s. and costs.

**ADULTERATED BUTTER.**—At the Clerkenwell Police Court, Charles Sterland, butterman, of 39, Central Street, St. Luke's, was summoned for having sold adulterated butter. Mrs. Robins said that she bought three-quarters of a pound of butter at the defendant's shop, and when Mr. Edes entered, the defendant said it was not sold as butter, and there was a stamp on the paper used as a wrapper to that effect. The butter was sold at 1s. 2d. a pound. Mr. Ricketts, for the defence, said that a person could not be convicted under the Act if he caused a legible notice to be given to the purchaser that the substance was not entirely butter, as long as the added matter was not hurtful. Mr. Edes said that in this case the substance was not butter at all, for it was composed entirely of other fatty matter. The magistrate having examined the paper in which the butter was wrapped, said the stamp was nearly illegible. Mr. Ricketts contended that this was caused by the sanitary inspector having scraped the butter off the paper with a knife. The defendant produced a stamp and printing ink, which he used to mark the paper in which he sold the butter. He had been prosecuted last May, and since then he had been very careful to let the public know what they purchased. He sold a great quantity of the butter, and his customers always knew what they bought. He called two witnesses to prove that the paper was stamped when the butter was sold to Mrs. Robins. Mrs. Robins said that she had not seen the paper stamped, and it was not until the

defendant referred to the matter that Mr. Edes saw some writing, and then he could not read the letters, The magistrate said that as the evidence was conflicting he should only impose the cost of the prosecution on the defendant.

**ADULTERATED MILK.**—Frederick Gerring, of 31, Eversholt Street, Camden Town, was summoned at the instance of the St. Pancras Vestry, for having, on August 12th, sold a pint of milk adulterated with water, to the prejudice of the purchaser. Mr. Ricketts appeared for the prosecution; and Mr. Wakeling defended. The milk was purchased in the presence of Mr. Roach, Sanitary Inspector for St. Pancras, it being analysed by Dr. Stevenson, Public Analyst. It was found to have been adulterated to the extent of 15 per cent. of added water. It was stated that the defendant was the owner of a hundred cows, and that he was in a large way of business. The milk was purchased from a man employed by the defendant, who sold it from a barrow in the street. Mr. Wakeling contended that the milk had not been divided into the customary three parts by the inspector in a fair manner, and not properly in the presence of the vendor. The magistrate fined the defendant 40s. and 12s. 6d. costs. The fine was paid, but the defendant gave notice that he would appeal against the decision.

**PROSECUTION BY THE METROPOLITAN DAIRYMEN'S SOCIETY.**—At the Edmonton Petty Sessions, Edward Gudgeon was summoned by Mr. A. Parish, Inspector of the Society, for selling to him adulterated milk on the 1st of August. The certificate of Dr. Redwood, the Public Analyst for the County of Middlesex, was put in, and it certified that the milk was adulterated with 26 per cent. added water. Defendant pleaded not guilty, and said he could not be answerable for the milk after it was taken from his house. The inspector bought it of his servant in the street. Alderman Abbiss (the chairman) informed him that he was answerable for his servant. Mr. Peckham, who appeared for the prosecution on behalf of Mr. Ricketts, informed the magistrate that the inspector purchased a sample at the shop which was adulterated; but the society did not wish to go on with that. The magistrates said it was a most serious case, as the milk was adulterated to the extent of one-fourth, and the defendant was liable to £20 penalty, but being the first time of his being before them they should fine him only 40s. and 21s. costs.

**ADULTERATED CREAM OF TARTAR.**—At the Chertsey Petty Sessions on September 24th, George Boyce was summoned for selling to Frank Walters a certain drug, to wit, 2 ounces of cream of tartar, to his prejudice, on the 19th of August. Mr. A. Haynes appeared for the defendant. Police-constable Waters said: On the 19th of August he went to Mr. Boyce's shop and asked for 2 ounces of cream of tartar and was served by the assistant. He paid 4d. for it. After receiving it he told the assistant it would be handed over to Supt. Bungard, who would take it next day to Guy's Hospital to be analysed. Witness asked him if he would like to keep a portion of it. The assistant said that he did not wish to do so. Witness then sealed it up in his presence and afterwards handed it over to Supt. Bungard. Supt. Bungard said: On the 19th of August he received 2 ounces of cream of tartar from last witness, and on the 21st took it to Guy's Hospital. He produced Dr. Stevenson's certificate, which stated the cream of tartar to contain 11·7 of tartrate of lime and 6 of sulphate of baryta, and that the foreign ingredients were insoluble and not injurious to health. Mr. Haynes addressed the bench and called Mr. Hodgkinson, of the firm of Hodgkinson and Co., Aldersgate Street, who said that defendant and his father before him had been customers of his firm for many years. Mr. Boyce was very particular, and was always supplied with the very best drugs. The cream of tartar which was the subject of the present case he had reason to know came from Messrs. Hodgkinson's stores. Cream of tartar was sent to this country from Spain and France and came in a state that was known as argol, and was consigned from the brokers to the manufacturers. The argol was generally taken from the docks by the grinders. The cream of tartar in question came into the market in the usual way and was ground by Messrs. Stafford, Allen and Sons, who returned it to his firm and they sent it out as it was purchased. Messrs. Allen and Sons were the only grinders of the drug. The article sent to Mr. Boyce was the very finest that could be obtained. Argol, or cream of tartar, was the natural product of the fermentation of the juice of the grapes. It was impossible to have cream of tartar without tartrate of lime, and he was informed from the best authority that it was generally found in quantities of from 10 to 20 per cent., and the lowest he ever heard of was 7 per cent. He recognized the sample of cream of tartar produced from its very fine grinding. It could not be obtained finer. He could not account for the very small amount of baryta being with the drug, but had seen it with cream of tartar before. Mr. E. R. Allen, of City Road, London, said his firm received a delivery order to obtain the cream of tartar in its crude state. It was then ground and sent to Messrs. Hodgkinson, and nothing was added to it. Mr. G. Boyce said he purchased the drug of Messrs. Hodgkinson and sold it as he received it. He believed it was the best quality that he could possibly buy. Dr. Horatio Paul, F.C.S., said the term "cream of tartar" was, according to the *British Pharmacopœia*, a synonym for acid tartrate

of potash. The article referred to was the medicinal form of acid tartrate of potash and that met with in commerce. It consisted essentially of the compound of tartaric acid with potash, together with some varying proportion of tartrate of lime, which was incidental to the manufacture of cream of tartar in the usual way. The presence of tartrate of lime in cream of tartar was indicated by the *British Pharmacopœia*. Sulphate of baryta was an extraneous impurity, but it was scarcely conceivable that so small a proportion as that indicated by the analyst's certificate could have been intentionally added as an adulteration. The only other possible explanation of its presence was accidental admixture; but it was an inert substance not injurious to health, and the trifling amount present did not sensibly affect the medicinal efficacy of the cream of tartar or its intrinsic value. The Chairman said the Bench were unanimous in dismissing the case.

SENDING SAMPLES BY TRAIN.—At the Hanley Police Court, on September 24th, James Paine, yeast seller, Stoke, was summoned by Mr. Lewis, inspector under the Act, for having sold some yeast which on analysis was found to be adulterated with 30 per cent. of potato starch. Mr. Ayre supported the complainant, and Mr. Sword defended. Mr. Lewis spoke to making a purchase of half a pound of yeast from the defendant, who was selling it at Northwood. He told the defendant it was intended for analysis. He forwarded a portion of the yeast to the Borough Analyst by train. In cross-examination by Mr. Sword, the witness said he did not say what analyst the yeast would be submitted to. Mr. Sword thereupon contended that the case broke down, as the act prescribed that the name of the analyst should be given to the seller. His objection was subsequently overruled on the production of a circular, a copy of which the inspector had given to the defendant at the time of the purchase, in which the Public Analyst for the Borough was specified. Mr. Hamshaw said there was another objection. The Act provided for the personal delivery of samples to the analyst unless he lived at a greater distance than two miles, in which case the samples might be transmitted through the registered post. The sending of samples by train was consequently irregular. Mr. Ayre submitted that the transmission by rail was also a legal delivery. Some articles, such as bread, milk, or pickles, could not be sent by post, and as the Borough Analyst resided at Hull, it would be expensive to take them. Mr. Hamshaw said that in cases of samples that could not be posted personal delivery was necessary. The bench thought the objection fatal, and dismissed the case, but, on the application of Mr. Ayre, promised to grant a case on the point, if he, on consideration, should request one. There was another summons in which Andrew Riley was charged with selling adulterated yeast. The same circumstances as to delivery existed in this case, and the summons was withdrawn.

IMPURE MILK IN SALFORD.—At the Police Court, before Mr. Makinson, Jno. Taylor, farmer, Cadishead, was summoned for having sold adulterated milk. The assistant-clerk (Mr. Walker) prosecuted, and Mr. W. Cobbett was for the defence. The evidence for the prosecution showed that on the 9th September the inspector took a sample of milk from a milk dealer named Bardsley, in Hough-lane, Broughton, and upon being analysed it was found to contain 16 per cent. of water. The inspector subsequently, from what Bardsley told him, accompanied him to the Central Station on the morning of the 11th September, and took a sample of the milk consigned to him by the defendant Taylor, and this being analysed was found to contain water in the same proportion as that Bardsley was selling when a sample of his milk was taken. Taylor was said to be the only person who supplied Bardsley with milk at the Central Station. The inspector stated that on the morning in question he saw the cans arrive at the Central Station. Bardsley, in answer to Mr. Cobbett, said he had been fined £10 and costs for selling adulterated milk. For the defence, witnesses were called to show that the milk was sent from the defendant's farm in a pure condition, and that it was sent on the evening of the 10th September, and must have arrived in Manchester the same night, Bardsley leaving it there until the next morning. The summons was dismissed.

A summons charging James Hunt, farmer, of Croft, near Warrington, with a similar offence, was then heard. Mr. Walker prosecuted, and Mr. Gooden defended. The evidence was to the effect that, on the 11th September, the inspector went with Bardsley from the Central Station to the Ordsal Lane station, where had arrived some little time previously two cans of milk consigned to Bardsley by the defendant. The inspector took two samples of the milk in Bardsley's presence, and the defendant was afterwards warned that his milk had been analysed and he might have a portion of the sample on application at the Town Hall. The defendant's solicitor now contended that the taking of the sample was informal, as the sample offered to them on application at the Town Hall was not sealed, and as at the time it was taken it was not "then and there sealed or otherwise securely fastened" as required by the Act, and said that instead of the sample being kept it should have been returned in the empty can

to the defendant. Mr. Makinson, after hearing the evidence of the defendant who swore that the milk was pure when despatched, said he had some doubts in the case. After some little discussion of the various points in the case, the hearing was adjourned.

At the adjourned hearing, a witness named MacLeod, who assisted the defendant and conveyed the milk to the station, was called. He stated that on the day in question it was despatched in a perfectly pure condition. A female witness, named Law, and who said she had been in the defendant's employment 13 years, stated that she assisted to measure the milk sent from the farm, and that she cleaned the cans. No water was ever mixed with the milk. Mr. Makinson said he had so much doubt in the case that he should dismiss it. It was possible for the milk to have been tampered with at the station between the time of its arrival and the time the inspector called. Having also regard to the penalty which had been previously imposed on Bardsley, and to the fact that it was greatly to his interest to endeavour to show adulteration on the part of the farmer, he could not come to the conclusion that the adulteration had been made at the farm. The case was accordingly dismissed.

The next case heard was that against Wm. Bennion, of 36, Brown Street, in which he was charged under a summons with selling adulterated milk. Inspector Thompstone said that on the 5th September he took a sample of the defendant's milk. He divided it into three parts in the usual way. The defendant told him at the time that he had got his milk from the man Bardsley mentioned in the last case. Mr. J. C. Bell, the Borough Analyst, stated that he received a sample of the milk in question from the last witness, and upon analysing it found it to contain 23 per cent. of water. The defendant said he had nothing to say, except that the milk was as he had received it from Bardsley. Mr. Makinson said it was no doubt true that Bardsley had been selling adulterated milk, whether knowingly or not, but the defendant was liable because he should exercise great care as to what he sold. He did not think it a bad case. The defendant would be fined 5s. and costs, or have seven days' imprisonment.

Jas. Bardsley, Hough Lane, the milk dealer mentioned in the previous cases, then answered to a summons which charged him with selling adulterated milk. Inspector Thompstone said that on the 9th September he took a sample of the defendant's milk at the time the defendant's son was delivering milk to the defendant in the last case (Bennion). Mr. Bell said upon analysis he found the samples of milk to contain 16 per cent. of added water. The defendant declared upon oath that he delivered his milk to his customers as he had received it. Mr. Makinson said he should treat the defendant's as an ordinary case. He should not deal with him as if it had been proved that the milk was delivered to him perfectly pure. A fine of 40s. and costs was inflicted.

**A DECEIVING LABEL.**—At the Worship Street Police Court, lately, Mr. James Wilkins, cheesemonger, of High Street, Hoxton, appeared to a summons, taken out by the parish authorities, for selling adulterated butter. Mr. Fletcher, a sanitary inspector of the parish, proved purchasing a pound of butter at the defendant's shop, and the certificate of the analyst, put in, showed that it was adulterated to the extent of 75 per cent. The defendant produced a placard, framed and glazed, which set forth that he would not be answerable for the butter sold at his "establishment" being pure and unadulterated. The inspector said that the butter from which he was supplied was labelled "This is butter." He did not see the placard produced. The defendant said he had not any label bearing the words "This is butter," but he produced two, one bearing the words, "Oh, mother, look! Is.;" the other, "This is better, 1s. 2d." The ticket bearing the word "better" was the one, he said, the inspector had mistaken for "butter." Mr. Bushby examined the placard and label, and said that the "e" in "better" was so rubbed that anyone might have taken it for a "u." The placard was also artfully contrived to deceive the passer by; for such words as "pure and unadulterated" were set out in large red letters, while the context, notifying that the defendant would not be responsible for the butter, was small and black, and rubbed. He thought the present a clear case of intention to defraud, and therefore ordered the defendant to pay a fine of £5, or suffer two months' imprisonment. The money was paid.

**ADULTERATED MILK.**—At Woolwich several cowkeepers and dairymen were summoned by the Woolwich Local Board of Health for selling adulterated milk. In the case of William Burcell, Mr. Wigner, the analyst, certified that the milk contained 18 per cent. of added water. Defendant pleaded that he bought the milk of a cowkeeper, and sold it in the same state. The Magistrate said he ought to have demanded a warranty, and fined him 15s. Thomas Florence, of Warwick Street, Woolwich, was alleged to have sold milk adulterated with 30 per cent. of water; he made the same defence as Burcell, and Mr. Carty, the inspector, said that defendant had been fined for the like offence 20s. in May last, and that he was doing a large trade in a poor neighbourhood. The Magistrate imposed a penalty of 40s., when the defendant said he would rather go to prison than pay. He was told to bring the money next week. Henry Peake, a cowkeeper in Chapel Street, Woolwich, was summoned for selling

milk of the same quality—30 per cent. water. He had been fined £2 in March last, and the inspector stated that most of the local dealers were supplied by the defendant. Mr. Hughes, the Local Board's solicitor, suggested that the defendant was the manufacturer. Defendant said he had been away from home, and his business had been managed by his children. The magistrate fined him £5, and said that if he came to the Court again he would probably fine him £20. William Edwards, one of the retailers supplied by Peake, was fined 20s.

**SELLING POISONED SWEETS.—AN EXTRAORDINARY DEFENCE.**—At the South Shields Police Court, on September 26th, George Wheatley, of Houghton-le-Spring, was summoned under the Sale of Food and Drugs Act, for having sold to Mr. J. J. Hindmarch, sanitary inspector for the borough, on September 13th, certain confections which were mixed with chromate of lead. The Town Clerk (Mr. J. M. Moore), who prosecuted, said the case was of some importance, inasmuch as it was a class of article sold largely to children, and at such a cheap rate that the quantity which they received for a small sum of money might do them a great deal of injury. Mr. Hindmarch was then called, and he stated that the defendant had a stall in the Market Place on Saturdays, and sold sweets. Witness purchased 6 ozs. of the confection produced from the defendant for 2d. He divided it into three equal portions, and had one of the portions analysed by Mr. Edger, the borough analyst. Mr. Edger's certificate showed that the yellow portions of the confection contained 0.68 per cent. of chromate of lead, a poisonous substance. Dr. Spear, medical officer of health for the borough, said that chromate of lead is a poisonous substance, and that the small quantity in question would contain rather more than six grains. It was a chronic poison, which accumulated in the tissues of the body, the bones, the liver, and the brain, and produced paralysis, and sometimes death. Even if the person who took it recovered, it might produce permanent injury. He believed it would be exceedingly dangerous for a child to eat a halfpennyworth of this confection daily for a few weeks. Defendant said he had just started in the business, and had had no experience of the trade. He engaged a man who had a thorough knowledge of the business, and he (defendant) expected that vegetable colours were used. He did not know how the man happened to take the wrong bottle; but he was having a cart painted just now, and the man took the wrong bottle, which was used for mixing yellow paint for the cart. The bench imposed a fine of £5, or two months' imprisonment.

**SOMERSET HOUSE MILK STANDARD.**—At the Thames Police Court, on Sept. 18th, Louis Roberts, a cow-keeper and dairyman, of 77, St. Leonard's Street, Bromley, was summoned by W. Harrison, one of the inspectors to the Poplar Board of Works, for selling milk from which one-half the cream had been abstracted. The purchase of the sample on the 3rd Sept. having been proved, Mr. Harrison produced the certificate of Mr. Young, the Public Analyst, which was to the effect that the sample was skimmed milk from which one-half the cream had been abstracted. The defendant was sworn and said the milk was obtained from one of his cows on that morning, and it was served to the customers just as it came from the cow. In reply to the Magistrate, the defendant said he wished to have the milk sent to Somerset House, for which purpose the case was adjourned. At the adjourned hearing, Mr. Lushington said that Mr. Young's certificate set forth that he found the milk submitted to him to be, in his opinion, skimmed milk, from which one-half of the cream had been taken. This form of certificate was, in his (the magistrate's) opinion, very unsatisfactory; he thought the analyst ought to state some facts upon which the magistrate could base his decision—if he decided the case upon a certificate such as the one before him, he really did so upon the *ipse dixit* of someone else without having anything before him upon which he could form his own judgment. On the other hand, in the certificate from Somerset House, the analyst stated that the sample of milk was deficient in fat to the extent of one-third of what was found in genuine milk, the percentage of cream or fat being 1.65. It had been found in some experiments that had been made that in some samples of milk of undoubted genuineness, that the percentage of cream or fat was as low as 1.57, or in even a less quantity than that of the milk in question. Added to this was the fact that this milk had been milked from the cow some hours before the purchase was made. Under these circumstances, therefore, he did not think he should be justified in convicting the defendant, and he should, therefore, dismiss the summons. Looking to the fact, however, that the milk was undoubtedly of a very poor character, he should order the defendant to pay the cost of the Somerset House Analysis.

The *Brewers' Guardian* says:—"The Public Analyst for Worcestershire, in his quarterly report refers to the salt in beer question, and states that he has himself brewed beers of various strengths, from 20 to 27 lbs. per barrel with distilled water and water containing a known amount of salt, and has found that the salt derived from the malt and hops amounted to from 10 to 12 grains per gallon; he, therefore, concludes that 15 grains of salt should be the outside quantity allowed for the malt and hops, which, added to that contained in the water used in the brewing, together with one-third more for increase by

evaporation, would give a fair estimate of the salt naturally existing in each sample of beer. He concludes that anything over this amount must be wilfully added as an adulterant. This is hardly fair, for brewers are legally allowed to use sugar in the manufacture of beer, and very few samples of sugar are free from chloride of sodium, and, therefore, the quantity of salt in a sample of beer may be considerably above the analyst's estimate, and yet have been legitimately introduced."

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### NOTES OF THE MONTH.

The case reported elsewhere, in which the magistrate, acting on the sworn evidence of the defendant and a relative (coupled with his own knowledge of the chemistry of milk) dismissed the charge, is specially noteworthy from two causes. Firstly, we have the *debut* of a magistrate who has really read up the literature of the subject of milk and formed his own opinion, and who, therefore, desires figures upon which he can himself judge as to the extent of any falsification. Despite the concurrence of the Somerset House chemists in the fact of deficiency of fat in the milk in question, Mr. Lushington, acting on his own knowledge, assumed the possibility of perfectly genuine milk with only 1.51 of fat, and accordingly declined to enforce a penalty. But, secondly, we have at last what is of infinitely greater importance to analysts as a body, a *distinct standard for fat in milk laid down publicly by Somerset House*. This is really a matter so important to us all that we print in full their certificate.

LABORATORY, SOMERSET HOUSE,  
London, W.C.

The sample of milk referred to in the annexed letter, and marked No. 159, was received here on the 19th instant.

The sample was securely sealed.

We hereby certify that we have analysed the milk, and declare from the result obtained that it contains 1.65 per cent. of fat.

From a consideration of this result, we are of opinion that the milk is deficient in fat to the extent of at least one-third the quantity found in genuine milk.

As witness our hands, this twenty-sixth day of September, 1879.

(Signed) J. BELL.  
R. BANNISTER.  
G. LEWIN.

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The Somerset House standard for fat in milk is therefore clearly 2.5 per cent., *i.e.* the figure adopted years ago by the Society of Public Analysts. This most valuable piece of information should be carefully noted by all analysts for future use, and is the more gratifying to us personally, seeing that it completely bears out the remarks we made last month as to the rapid shaking into order of the points of chemical variance, and is the first complete accordance on the part of the Government Analysts with the standards laid down by our Society. If Mr. Bell and his colleagues would only continue to give such lucid and practical certificates, all the difficulties would quickly fade away, and the absurd restrictions placed upon their action as scientific men be evaded in a very simple manner. Meantime we tender them the congratulations of their fellow workers in food analysis for their action in the present case.

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In a letter to the *Glasgow Herald*, Dr. Wallace, the City Analyst, calls attention to a source of danger as follows:—

"About three months since, a serious case of illness in a child caused by eating or sucking a toy watch was reported to the Medical Officer of Health, who directed a

similar one to be sent here for examination. It consisted of a green paper dial, surrounded by pink sweetmeat stuff, and the paper was found to contain about one-fifth of a grain of arsenious acid—quite enough to account for the child's illness. Happening to play recently with a pack of green-backed cards, it occurred to me that the colour was the same as that on the paper of the toy watch, and I have accordingly made an analysis with the result that each card was found to contain 1.6 grains of arsenious acid and .91 grains of oxide of copper—or, in a whole pack, 83 grains of arsenious acid and 47 grains of oxide of copper. The green colouring matter (arsenite of copper) was entirely on the back of the cards, and by the aid of a little alkali and water was easily removed. When it is considered that the pack contains nearly one-fifth of an ounce of arsenic—more than enough to kill a hundred children—the practice of using this dangerous colour cannot be regarded with indifference. Unfortunately there is no law to prevent the use of dangerous pigments on wall papers or playing-cards, but it is well that the public should be informed of the matter so that they may be on their guard."

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If we were in America we could understand an unwillingness on the part of the public to part with their "greenbacks," but here, where the colour has no such important signification, it is well that card players should take note and avoid the alluring but dangerous articles. In Germany the Adulteration Act gives power to prosecute in such a case, and we commend Dr. Wallace's letter to Dr. Carr, the great opponent of the use of arsenical colours, whose book on *Domestic Poisons* we noticed some months ago.

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If the researches of Dr. Emmerich, of Munich, be relied on, all the agitation to bring water analysis within the obligatory fee of 10s. 6d., which took place lately, was thrown away; for the Professor not only declares that "the use of the most foul and putrid drinking-water produces no injurious result on the system in health; and even existing affections of the intestinal canal are not in the least aggravated by it," but that it actually cured him of a sharp attack of bowel complaint. The experiments were made not *corpore vile*, but on himself, and the water chosen was from a ditch fed, *inter alia*, by drains and privies, seasoned by the contents of dirt carts, and ornamented here and there by the bodies of departed cats. The "physical appearances" observable were fragments of fæces, dirty rags, hairs, and the general garbage of man and beast; and the odour was so well developed that it was difficult to avoid at once returning the lovely mouthful. At first the determined experimentalist experienced certain internal qualms, but after three days they vanished, and lo! he throve on his unsavoury tippie! He next gave it to a dyspeptic patient, and he decidedly improved; so after all good clean dirt for ever. Why go to the trouble to buy liver pads, or anti-fat, when we can get the real elixir of life from the nearest ditch? or rather, what a chance for an enterprising man to bottle foul water and advertise it as the genuine Munich tonic and stomachic essence, prepared after the recipe of the great doctor;—goodness knows the ingredients are both cheap and easily obtained, and the source inexhaustible!

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But, joking aside, is it wise to publish such experiments to a public already too prone to sanitary neglect, and does it follow that because the experimenter escaped

with his life, others would be safe to imitate him? It has been the result of our observations that it is possible to acclimatize persons to bad water just as to jungle fever, so long as no epidemic actually starts in the neighbourhood; but bring in one diseased person, and then the train is fired. It is a common remark in the country when well waters are analysed and condemned: "Oh we have drank it for years, and the analyst is talking nonsense;" but notwithstanding it is none the less the duty of all in authority to repress as far as possible the use of any water evidently subject to periodical contamination.

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"Oh Mother, look! 1s."—"This is better, 1s. 2d.," so wrote an enterprising butterman of High Street, Hoxton, taking care to well rub the first "e" in the word "better" so as to make it appear like "u." Whether mother looked is not recorded, but an Inspector did, and Mr. Bushby, in a friendly interview with our butterman, fined him £5, and added some disagreeable remarks about intention to defraud.

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Still another victim to the odious analysts! A poor innocent man of Houghton-le-Spring happened to be a confectioner, who painted his cart yellow, and afterwards in his honest ignorance and praiseworthy economy, he used the same pigment for his sweets; and will it be believed that the analyst actually found '68 per cent. of chromate of lead, and on that "miserable decimal," as one of our trade journal friends used to call it, the magistrates fined him £5.

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The clause in the new Act, providing a penalty for refusing to serve in the street, has already been enforced with success. It would be well if the attention of Inspectors were more definitely called to this point, as there is no doubt much more adulteration practised in milk delivered at private houses than in that sold over the counter.

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Under the heading of impure milk in Salford, we publish a full report of a series of cases in which the greatest care was taken by the inspectors to relieve the retail tradesman by tracing the adulteration to its source, but without result; the magistrate giving the farmer the benefit of the doubt, that the milk might have been tampered with after leaving his hands and before delivery at the railway station.

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We publish a letter from Dr. Dupré, on the subject of the evidence lately given by certain officials connected with the Pharmaceutical Society, which is sufficiently outspoken in itself to require no comment on our part. We were, however, much struck by a passage in the evidence of Dr. Attfield, given in the soda-water case, and reported in the *Chemist and Druggist*. Asked, in cross-examination, "Are you a Public Analyst?" Dr. Attfield answered "Yes, and have been for 25 years, but not under the Act. I have always refused appointments of that kind." If this be really accurately reported, we have rarely met with a more daring instance of special pleading by a witness on oath. The term "Public Analyst" was specially created by Act of Parliament to distinguish those analysts appointed to perform the duties of that Act, and no man can call himself one



merely on the strength of having practised as an analytical chemist, except by a very great perversion of the true and legal meaning of the term. We hold that in doing so a person assumes a *status* to which he has no right. It is curious that with one breath Dr. Attfield should seek to usurp our title, while with the next he should assume such an insufferable affection of superiority. He always declined appointments under the Act, says our learned friend; and it would be interesting to know how often he actually had the chance of so doing.

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### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1879. No.	Name of Patentee.	Title of Patent.	Price
719	G. A. Aitchison .. .. .	Preserving Cod Liver Oil.. .. .	2d.
786	J. W. Swan and B. S. Proctor ..	Medicinal Rhubarb .. .. .	4d.
830	G. G. André .. .. .	Electric Lamps .. .. .	8d.
876	J. B. Spence .. .. .	Electric Lighting .. .. .	2d.
889	F. J. Jenssen.. .. .	Manufacture of Benzaldehyd, Benzoic Anhydride, and Benzoic Acid.. .. .	2d.
895	H. E. Newton .. .. .	Reducing Alkaline and Earthy Sulphates and Chlorides to their Elements .. .. .	.. .. .
947	H. J. Haddan .. .. .	Apparatus for Electric Lighting .. .. .	8d.
925	K. W. Hedges .. .. .	Electric Lamps .. .. .	6d.
919	C. S. Gorman .. .. .	Manufacture of Anhydrous Sulphuric Acid .. .. .	2d.
927	R. C. Thompson .. .. .	Electric Light .. .. .	2d.
1045	W. Morgan and E. R. Daniel ..	Deoxydizing Iron.. .. .	2d.
1047	J. Cawley .. .. .	Manufacture of Sulphide of Zinc .. .. .	2d.
1054	J. C. Martin .. .. .	Manufacture of White Lead .. .. .	6d.
1070	W. A. Barlow .. .. .	Extracting Tannin .. .. .	4d.
1081	R. V. Tuson .. .. .	Disinfectants .. .. .	2d.
1122	St. G. L. Fox .. .. .	Electric Light .. .. .	2d.
1131	T. Griffiths and J. Cawley ..	Manufacture of Sulphide of Zinc .. .. .	6d.
1207	T. A. Dillon .. .. .	Producing Electric Lights .. .. .	4d.
1226	C. Rumpff .. .. .	Manufacture of Azodyes from the Nitrosubstitution Products of Benzol, &c. .. .. .	4d.
1510	J. Watson .. .. .	Manufacture of Portland Cements .. .. .	4d.
1530	J. Allmann .. .. .	Oxidizing Sulphides of Sodium and Potassium in Alkaline Solutions .. .. .	4d.
1410	H. F. Howell.. .. .	Purifying and Deodorizing Crude Petroleum, and other Oils .. .. .	6d.

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### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewer's Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Boston Journal of Chemistry; The Provisioner; The American Dairyman; The Practitioner; American New Remedies; Proceedings of the American Chemical Society; Le Praticien; The Inventors' Record; New York Public Health; Philadelphia Printers' Circular.

# THE ANALYST.

DECEMBER, 1879.

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## SOCIETY OF PUBLIC ANALYSTS.

AN ORDINARY MEETING of this Society was held on Wednesday, the 19th November last, at Burlington House, Piccadilly. In the absence of the President, Dr. Muter, through indisposition, the chair was taken by Vice-President Dr. Dupré, F.R.S.

The minutes of the Sheffield meeting were read and confirmed.

Professor C. R. D. Tichborne, President of the Pharmaceutical Society of Ireland, and Public Analyst for the County of Longford, was proposed for election as a Member, and will be balloted for at the January Meeting.

Mr. B. Dyer and Mr. O. Hehner were appointed Auditors to examine the accounts for the current year.

Dr. Tripe read a paper "On the Discrimination of the Starches by Polarized Light," and illustrations of the methods adopted were given by means of a microscope and other apparatus kindly lent for the occasion by Messrs. Murray and Heath.

Mr. Hehner read a paper "On the Mineral Constituents of Cinnamon and Cassia."

Mr. Wigner read a paper by Mr. A. H. Allen, "On the Examination of Coffee."

Mr. Heisch read a note by Dr. Wallace "On Arsenic in Playing Cards."

Mr. Wigner read a paper "On the Determination of Carbonic Acid in Carbonates."

Messrs. Murray and Heath also sent for exhibition some Steinheils' pocket lenses, which, from their large and flat field, were much approved of.

An Extraordinary Meeting had been called at the same time and place, but Dr. Dupré postponed the resolution, which stood in his name, for twelve months.

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The Annual Meeting will take place on Wednesday, January 14th, when the election of officers, &c., will take place, and among the papers to be read is one "On a Sample of Butter several hundred years old."

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## ON THE DISCRIMINATION OF STARCHES BY POLARIZED LIGHT.

By JOHN W. TRIPE, M.D., M.R.C.P., Edin., &c.

*Read before the Society of Public Analysts, on 19th Nov., 1879.*

SOME time since the Inspector appointed to obtain samples under the Sale of Food and Drugs Act, brought to me several packets containing arrowroot, pea-meal, ground lentils, maizena (Indian corn flour) and ground ginger, all of which were found to be genuine. During the course of examination, I felt dissatisfied with the means ordinarily adopted, and therefore employed selenite plates with the polariscope. The plates used were red and green, and blue and yellow, when a beautiful play of colour was exhibited by the arrow-roots, and even in a more marked degree by potato starch

and *tous les mois*. The colours shown by Bermuda arrowroot were not so brilliant as by those from St. Vincent and Natal. The starches of wheat, barley, oats, and rice scarcely showed any colour, and the little that was exhibited was equally diffused over the whole granule instead of being more brilliant in certain parts as obtained in the preceding class. Maizena starch presented considerably more colour than that of wheat, whilst that of lentils, peas, and beans, became less coloured than maizena, and, like wheat, did not show green colouration. The amount of colour varied considerably, according to the plate used, being usually much brighter with the green and red than with the blue and yellow, although in sago there was little or no colour with the former, whilst a band of a somewhat sober shade was visible with the latter across the narrow end, and the starch of ginger gave a slight iridescence with the red and yellow, but not with the other plate, the colour being spread over the whole surface of the starch, as in wheat, &c.

The prismatic colours of *tous les mois* and potato starch were very brilliant with the green and red plate, the green being more vivid in the potato than in the arrowroot, so that in case of doubt or when a mixed sample is examined, the comparative soberness of the colour of arrowroot will readily serve to distinguish one from another. A little care in using the analyser is necessary in order to bring this out strongly, but a comparison between the two without moving the analyser will show this most satisfactorily, the analyser being used in such a way as to give a red or green ground, the red being the best.

The starches examined evidently belonged to two groups, viz., those which showed but little colour with the selenites, and the others which exhibited brilliant and various colours. It is evident that there must be some structural difference between the two, for as a rule the starches obtained from seeds gave but little colour, whilst those obtained from tubers and rhizomes afforded much colour. Of course there are exceptions, as stated, as regards ginger, &c. The use, however, of this plan of diagnosis need not be confined to the starches, as the spiral ducts of some plants colour more than others, and the woody fibre and cells differ sufficiently in colour to assist in the discrimination of the substance examined; for instance, coffee shows numerous coloured pieces of tissue which are absent in chicory.

The best results seem to be obtained by using low objectives, half-an-inch with an A eye-piece being decidedly preferable in my opinion to higher powers, and I may mention that the solution employed was one part of glycerine and three of water. One great advantage of this method of diagnosing starches consists in the ease and rapidity with which the starches of cereals can be distinguished from those of potato and arrowroots, when compared with the ordinary methods of examination, in which considerable time is often occupied in measuring the size of the granules, or in bringing out their markings. I also find that I can see the markings much more plainly with the selenites than without them, which, however, may only arise from a peculiarity of my sight, which is not only near but weak. I have not worked out this subject by any means to my satisfaction, for want of time, and therefore hope that some one else may make a more extended investigation of the whole matter.

The members present then inspected samples through the microscope lent by Messrs. Murray & Heath.

Dr. Dupré said anything which would make the microscope work more readily would be a considerable advantage; a clumsy microscopist would not mistake wheaten starch for arrowroot, but with a middling sized potato starch it required considerable experience to distinguish it.

Mr. Wigner was convinced that all the assertions made by Dr. Tripe were correct, and it would, he thought, be a most useful process; he had not yet, however, carried it beyond the starches which Dr. Tripe had mentioned.

#### NOTE ON ARSENIC IN PLAYING CARDS.

By DR. WALLACE.

*Read before the Society of Public Analysts, on 19th November, 1879.*

IN the last number of THE ANALYST, a letter to the *Glasgow Herald* was quoted, in which I stated that I had found a large quantity of arsenic in a pack of green-backed playing cards. I have since extended my observations, and now bring the matter before the Society of Public Analysts, in the hope that public attention may be drawn to it in such a way that legislation may follow, not only in regard to playing cards, but also to wall papers, and paper used for book covers, confectionery and other purposes. Such a law already exists in Sweden, and I have reason to know that it is very strictly enforced. The following are the results of examination of a few cards, from which it will be seen that the use of arsenical green is not confined to any particular maker:—

	As <sub>2</sub> O <sub>3</sub>	As <sub>2</sub> O <sub>3</sub>
	Grains in each Card.	Grains per Pack.
De la Rue, Plain Green .. ..	1·49 .. ..	77·48
Ditto, Figured .. ..	·86 .. ..	44·72
Goodall, Plain Green .. ..	1·84 .. ..	95·68
Ditto, Figured .. ..	·63 .. ..	32·76
Ditto, ditto .. ..	·50 .. ..	26·00
Willis, Plain Green .. ..	1·60 .. ..	83·20
Ditto, Figured .. ..	·31 .. ..	16·12
Ditto, ditto .. ..	1·45 .. ..	75·40

The plain green backs, usually called club cards, contain the largest proportion of arsenic, while the figured ones have more or less according to the pattern. It is unnecessary for me to point out to the members of the Society the danger arising from the introduction of a powerful poison into an article in such general and frequent use as playing cards; it is enough to state the facts. I have only to add that, so far as I have had an opportunity of examining pattern books of various makers, arsenical-coloured cards constitute about one-sixth to one-eighth of the whole number manufactured.

Dr. Dupré said that cards were so constantly used, that he should have thought if there was really any danger there would have been many complaints of sore fingers, but he had not heard even a rumour. He, however, had had a number of lamp screens to examine, and nearly all contained arsenic.

Dr. Bartlett referred to a case he had been engaged in, where a girl had died after having been employed for a few weeks in a factory, where she had been engaged in dusting arsenical powder on paper.

WITH reference to the above subject, the *British Medical Journal* has the following:—

Mr. Jabez Hogg writes:—The *British Medical Journal* of the 18th Oct. directs public attention to the dangers of poisoning by the use of arsenic in playing cards. The following relates to a case of psoriasis unguium from the same cause. A lady, fond of a rubber of whist, for a considerable period suffered from a painful soreness of the tips of the fingers, extending to the roots of the nails, which became, in consequence, altered and misshapen. She had become convinced of the fact that an hour or two spent in card-playing increased the pain and tenderness; often so much so, that she was unable to deal. This went on, and in the meantime all kinds of domestic medicines were tried without effect. A medical friend, who was one of the party seated round the table, and into whose ear Mrs. W. (the lady in question) was pouring her distress, but whose eye just then caught the bright green backs of the cards as they fell on the table, half-jokingly remarked, "Arsenical cards." He said that the painful condition of his hostess' fingers was, in his opinion, due to the arsenical pigment on the backs of the cards. Mrs. W., it appeared, had a decided preference for green-backed cards. The next day, some of the pigment was scraped off a card and tested for arsenic, and an estimated quantity of arsenious acid crystals was produced. The discontinuance of the use of the cards soon led to a greatly improved state of the fingers. A pack of cards used by my children in a game of forfeits, the backs of which were of a bright green colour, on being examined, turned out to be coloured with arsenite of copper.—Dr. Wallace has sent specimens of the cards referred to in the *Journal* of October 18th to Mr. Hogg. They are London-made cards; and it is a fact that manufacturers of repute send out hundreds of similar packs of cards, the backs of which are coloured with a poisonous arsenical pigment. Between the shuffling of the cards and the warmth and moisture of the fingers, a considerable quantity of arsenite of copper will be detached and inhaled during the evening. Arsenical poisoning by coloured sweetmeats is a source of danger against which parents should be on their guard. Dr. Russell, the Medical Officer of Health of Glasgow, has furnished Mr. Hogg with the following particulars of the narrow escape of two children by sucking the coloured sugar off a toy-watch purchased at a sweet-shop. A medical practitioner reported that he had been called to see two children who seemed to be suffering from the effects of an irritant poison. On inquiry, it was found that they had quite recently eaten some sweetmeats made in the form of a watch. The parents produced one, the outer rim of which was composed of sugar coloured pink. The face was green printed paper pasted on behind, and overlapped the rim fully one-half its breadth. When this green paper was removed, a portion of the green pigment adhered to the sweetmeat; and, on submitting this to analysis, it was found to be arsenite of copper. The quantity on the entire face of the watch was estimated at eighteen grains of arsenic. Dr. Russell adds that "cases of poisoning from sugarsticks wrapped in striped green-coloured paper to attract the bairns" have also occurred. A gentleman also consulted Mr. Hogg for dimness of sight and a severe eczema of the forehead. The eczema had troubled him for several months. Since its appearance, the sight of one eye had become dim. The eruption proved very intractable; and, in one of his visits, Mr. Hogg questioned him closely about the wall-papers of his rooms; but these, he was assured, were non-arsenical. A visit to the country effected what medicine could not; it cured the eczema; but, on his return to his duty, the eruption reappeared. Three weeks ago, on entering Mr. Hogg's room, he placed his hat on the table; and, the bright maroon having at once attracted Mr. Hogg's notice, he suggested that the hat-lining was the cause of the eczema. A portion was removed and examined for arsenic, and a considerable quantity was found. The use of the hat was discontinued, and the eruption quickly disappeared. He was, however, curious about the matter, and thought he should like to be convinced of the poisonous nature of the lining. The hat was taken out; and, placing it on his head, he left home. The forehead became irritable, and on the second day the eruption reappeared. He was now thoroughly convinced. The improvement that took place when he went to the country is explained by the fact, that during his stay he almost invariably wore a wide-awake, and not the usual chimney-pot hat.

The following letter has also appeared in a Glasgow journal:—

SIR,—My attention has just been directed to a letter which appeared in a recent issue of your paper, in which Dr. Wallace sounded a note of warning against the presence of arsenic and oxide of copper in various manufactured articles, and mentions that in a single pack of cards he had discovered as much as 83 grains of the former and 47 grains of the latter poison, the pack containing nearly "one-fifth of an ounce of arsenic; more than enough to kill a hundred children." At the same time he regretted that "unfortunately there is no law to prevent the use of dangerous pigments on wall-papers or playing cards." As the "Adulteration of Food Act" legislates against the introduction of deleterious compounds

into articles of food, there is certainly no reason why it should not be extended to embrace all articles of household and personal use. On the above subject it may be interesting to your readers to know what has been done in this direction in Sweden. Some years ago the attention of the Swedish authorities was seriously directed to the peculiarity of many cases of sickness, cramp, debility, depression, loss of appetite, inability to work, &c., which were quite unaccountable until clearly traced to poisoning by the presence of arsenic in paints, colours, wall-papers, ladies' dress stuffs, ribbons, carpets, curtains, blinds, pasteboard boxes, confectionery, &c. In cases of poisonous wall-decorations, the removal of patients to other chambers secured recovery, while the return to the arsenious-decorated rooms brought back the original illness. For special cases with these and other materials see "Gradualafhandling, by Dr. Adolph Grape, 1877," which can easily be procured by applying to him at "Geffe, Sweden," where he is practising. The evil influence was not confined to what is now pretty generally known as "arsenious green," but was traced in reds, browns, and yellows, in printed cloth. Nor did the use of these arsenious colours even when applied in the form of oil painting on walls, &c., prevent the generation of dangerous vapours, seriously affecting those living, and especially sleeping, near them. Some beautiful green lamp shades were found to be very dangerous, the distribution of the poison being assisted by the heat of the lamp. So painful and so numerous were the troubles arising from the presence of arsenic in various forms that the Court Chemist, Dr. Hamberg, and the (Stockholm) City Analyst, A. W. Cronqvist (with whom the undersigned was engaged), investigated thousands of cases which caused prompt and rigid action to be taken. The result of the above was that, about four years ago, a stringent law was passed prohibiting the sale of any articles containing poisons, especially arsenic. This Act is so rigidly enforced that the slightest trace of arsenic leads to the confiscation of the goods and the fining of the seller. Some such law is clearly necessary to prevent the possibility of such a state of matters as Dr. Wallace has disclosed, which every respectable physician and chemist in the country can endorse and strengthen by the contribution of other instances.—I am, &c.,

C. O. L.

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## ON THE MINERAL CONSTITUENTS OF CINNAMON AND CASSIA.

By O. HEHNER, F.C.S.

*Read before the Society of Public Analysts, on 19th Nov., 1879.*

THE discrimination between ground cinnamon (*Cinnamomum Zeylanicum*) and cassia (*C. Lignea* and *C. Vera*) is a matter of some importance, but of considerable difficulty. These spices are imported into this country in very large quantities. Thus during the first forty-three weeks of this year 18,002 packages (of 56-lbs. each) of *C. lignea*, against 13,212 packages of cinnamon (each weighing about  $\frac{3}{4}$ -cwt.), and during the same period of last year, 45,433 packages of cassia and 13,489 of cinnamon were imported. The wholesale prices of cinnamon fluctuate between 6d. and 4s. 3d. per lb., whilst cassia barely reaches 6d. Considering now the extreme similarity between these barks, both botanical and structural, not a little inducement exists to substitute the cheaper for, or mix it with the more valuable spice, and it is a fact, that notwithstanding the large amount of cassia imported, it is almost impossible to obtain it under its proper name at retail establishments. I am informed that cinnamon sticks are never ground, but always sold in their whole state, only cinnamon chips and cassia being powdered. Much cassia, no doubt, is used by distillers of essential oils, manufacturers of mixed spice and of curry powder, but it cannot be doubted that much of it finds its way into the consumer's hands under a name to which it has no valid claim. However this may be, it is important to Public Analysts that they should be in possession of means to discriminate between the two kinds of bark.

The only test which, as far as I am aware, has been in use, is that founded upon the alleged difference in the behaviour of the decoctions towards iodine. Thus Flückiger and Hanbury direct in their *Pharmacographia* to "make a decoction of

powdered cinnamon of known genuineness, and one of similar strength of the suspected powder. When cool and strained test a fluid ounce of each with one or two drops of tincture of iodine. A decoction of cinnamon is but little affected, but in that of cassia a deep blue-black tint is immediately produced." But, considering that both cassia and cinnamon contain much starch—as shown by the microscope—it seems *a priori* improbable that cassia starch should act normally towards iodine, whilst that of cinnamon refuses to do so. The different amount of tannin would certainly not explain the distinction as has been suggested by Pereira, as *both* cassia and cinnamon are rich in tannic acid. But the fact is that decoctions of *both* cassia and the cheaper kinds of genuine cinnamon turn blue with iodine. A few drops of iodine are first decolorized by the solutions, but a point is readily reached when the blue colour permanently makes its appearance, modified, of course, by the yellow colour of the decoction. The finest samples of cinnamon do not react much with iodine, probably because, on account of their immaturity, they contain little real starch. The iodine test is therefore of very questionable value, and genuine cinnamon might by it be condemned as adulterated. It may be admitted that in the case of cassia the reaction is obtained more readily than with cinnamon.

To find, if possible, some real difference between the two kinds of bark, I examined their mineral constituents, believing that the more woody bark, cassia, would contain a larger amount of salts of lime and magnesia than the delicate membranous cinnamon. The following analyses show, however, that this supposition was not entirely substantiated. All analyses were made upon the ash obtained at the lowest possible temperature (below visible red heat), but not recarbonated, that is to say, precisely as they would result in an ordinary analysis.

	Per lb.	CINNAMON.			CASSIA.		
		1/10	3/0	3/6	Lignea.	Vera.	
Coal .. ..	..	0.27	0.41	0.31	..	1.26	—
Sand .. ..	..	1.09	0.53	0.52	..	3.16	0.24
Si O <sup>2</sup> .. ..	..	0.27	0.31	0.25	..	0.90	0.20
C O <sup>2</sup> .. ..	..	29.29	32.27	32.40	..	27.18*	36.26
P <sup>2</sup> O <sup>5</sup> .. ..	..	3.52	2.20	3.00	..	3.67	1.13
SO <sup>2</sup> .. ..	..	2.42	2.73	2.84	..	2.02	0.71
Cl .. ..	..	0.18	0.51	0.76	..	0.14	0.09
Fe <sup>2</sup> O <sup>3</sup> .. ..	..	0.78	0.41	0.46	..	1.23	0.14
Mn <sup>2</sup> O <sup>3</sup> .. ..	..	0.86	0.97	0.13	..	5.11	1.13
Ca O .. ..	..	40.09	36.98	40.39	..	25.29	52.72
Mg O .. ..	..	2.65	3.30	3.86	..	5.48	1.10
K <sup>2</sup> O .. ..	..	14.22	16.70	10.35	..	20.58	5.60
Na <sup>2</sup> O .. ..	..	3.98	2.97	4.65	..	3.98	0.90
		99.62	100.29	99.92	..	100.00	100.16
Ash .. ..	..	4.78	4.59	4.66	..	1.84	4.08

\*By difference.

	Retail, per lb.	WHOLE CINNAMON.				CINNAMON CHIPS,		
		1/10	3/0	3/6	9/6	6/0	contg. wood, 9d. per lb.	
Moisture .. ..	..	12.67	12.05	11.38	11.64	12.94	..	11.25
Ash in bark .. ..	..	4.78	4.59	4.66	3.44	4.28	..	4.44
Lime in Ash .. ..	..	40.09	36.98	40.39	34.32	36.99	..	42.11
Mn <sup>2</sup> O <sup>3</sup> .. ..	..	0.86	0.97	0.13	0.62	0.59	..	0.34
Soluble Ash .. ..	..	25.04	28.98	25.22	26.36	27.67	..	18.34
Insoluble Ash.. ..	..	74.96	71.02	74.78	73.64	72.38	..	81.66

	CASSIA LIGNEA.			CASSIA VERA.		
		Whole.	Ground.			
Moisture .. ..	14.22	11.88	11.05	..	10.37	11.36
Ash in Bark .. ..	1.84	2.54	2.55	..	4.08	4.85
Lime in Ash .. ..	25.29	34.49	28.63	..	52.72	43.40
Mn *O* .. ..	5.11	4.94	3.55	..	1.13	1.53
Soluble Ash .. ..	40.58	26.78	30.91	..	8.36	15.89
Insoluble .. ..	59.42	73.22	69.09	..	91.64	84.11

Examining these figures it appears—*First*, that the *proportion of ash* in cinnamon fluctuates between comparatively narrow limits. Cassia vera contains an amount equal to that of cinnamon, but *C. lignea* yields much less. *Secondly*, that the amount of *ash soluble in water* is about one quarter of cinnamon ash, less in *C. vera*, more in *C. lignea*. *Thirdly*, that cinnamon ash contains less than one per cent. of *oxide of manganese*, *C. vera* upwards of one per cent. *C. lignea* far more, up to five per cent. This is indeed the most noteworthy feature brought out by the analyses. The amount of manganese has a direct influence upon the colour of the ashes. Thus all cinnamon ashes are *white*, or nearly so, those of both descriptions of cassia *grey* or *brown*, and the latter, when heated with hydrochloric acid, yield an abundance of chlorine gas. Thus the amount of manganese serves to distinguish cinnamon from *C. lignea* with a high degree of probability, and even a comparatively moderate admixture of the latter would thus be rendered evident in the former. The manganese is most readily separated from the ash by means of bromine after the phosphate of iron has been precipitated by acetate of soda.

The difference between cinnamon and cassia vera is not so marked, but the low proportion of soluble ash in this will be a point worthy of notice. But *C. vera* is only imported to a very small extent, and it is as an adulterant or substitute, of far less importance than the cassia commonly so-called, namely *C. lignea*. It is, moreover, so mucilaginous that when heated with water it yields a glairy or ropy decoction.

All of the samples, the analyses of which are reported above, were of undoubted purity, and many of them were kindly furnished me by Messrs. J. Travers and Son, to whom I am much indebted. My thanks are also due to Mr. E. Riley for having assisted me in carrying out the investigation.

Dr. Dupré asked Mr. Hehner whether he had any information as to the places where the cinnamon and cassia came from. It might be that this remarkable amount of manganese was not always found; was there reason to suppose that it was really a characteristic of cassia, or that it was due to a local peculiarity of the district.

Mr. Stewart asked if Mr. Hehner had made any determinations of the quantity of iodine added in each case; it seemed to act much more rapidly with cassia than with cinnamon.

Mr. Hehner, replying to Dr. Dupré, said that he had had one of the samples of cassia lignea for two years, two other samples were quite recent, two cheap cinnamons were recent also, and they gave an ash very rich in manganese, which no doubt proved that they consisted of cassia. He had no doubt that by far the largest amount of ground cinnamon sold was really cassia. In reply to Mr. Stewart, he said cinnamon decoctions required, as a rule, a very much larger quantity of iodine. The test as given in different books was really contradictory. Flückiger and Hanbury say: first add one or



two drops, and "a deep blue-black tint is immediately produced," and a few lines further on they say, "But the colour quickly disappears and becomes permanent only after much of the test has been added." No doubt there is a little more starch in cassia than in cinnamon.

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## ON THE DETERMINATION OF CARBONIC ACID IN CARBONATES.

By G. W. WIGNER, F.C.S.

*Read before the Society of Public Analysts, on 19th November, 1879.*

THE results obtained by the determination of carbonic acid in earthy, metallic, or other insoluble carbonates by decomposition with dilute acid in any of the ordinary forms of carbonic acid apparatus, are not of a satisfactory character. There is great difficulty in ensuring the complete decomposition of the carbonates, and almost equal difficulty in driving off the last traces of carbonic acid gas without incurring a loss of the acid used for decomposition, and thereby an apparent increase in the proportion of carbonic acid present. Even in the case of the alkaline carbonates, the results obtained in this way are less accurate than could be wished; but when carbonate of lead, or carbonate of baryta, or, still worse, mixtures of the two are treated, it will be found that the results obtained in the ordinary way will not only be somewhat irregular, but will, in most cases, show an error equal to as much as 2 or 3 per cent. of the total carbonic acid present.

In the case of white lead, where the proportion of carbonic acid present is really the standard by which to judge of its suitability for use as a paint, an error of this kind is a very serious one. The only satisfactory process by which carbonic acid can be estimated in such samples as these, is by measuring the volume of the gas evolved on treating the sample with dilute acid, and ascertaining that this gas is entirely carbonic acid.

For some years I have used a process of this kind, and after making some hundreds of determinations by it, I am convinced that, with proper care, the error in the determinations of carbonic acid need in no case exceed  $\cdot 10$  or  $\cdot 05$  of the total amount present. This greater accuracy is moreover attained without the use of any complicated apparatus, excepting a suitable gas measuring apparatus. Its attainment depends entirely on carrying out the decomposition of the carbonates in a partial vacuum, so that the liberation of the carbonic acid proceeds rapidly and freely at a temperature considerably below the ordinary boiling point of the solution. By this means the time necessary for the decomposition is greatly shortened, and the risk of the evolution of any other gases than carbonic acid is also decreased.

The apparatus required is as follows:—A test tube about 8 inches by 1, fitted with a good india-rubber cork having two holes through it; one hole is provided with a thistle funnel with stopcock, and the other hole with a glass tube of small bore also furnished with a stopcock. This test tube constitutes the decomposition apparatus; the thistle funnel is for the introduction of the acid by which the decomposition is effected, and the small tube for carrying the evolved gases into the measuring apparatus.

In addition, I use a small test tube about  $1\frac{1}{4}$  in. long and  $\frac{1}{4}$  in. diameter to contain the sample to be analysed.

The following is the mode in which I treat the sample:—A small portion, generally in the case of white lead about 30 or 40 grains, is weighed into the small test tube; a small quantity of hot recently boiled distilled water is put into the larger test tube, and the small tube dropped into it. The quantity of water should not be more than sufficient to fill one inch of the larger tube. The decomposition tube is then securely corked, the stopcock leading to the gas apparatus closed, and the stopcock on the thistle funnel opened. The water in the decomposition tube is now rapidly and strongly boiled; the steam, which is liberated, expels all air from the tube through the thistle funnel. After the boiling has continued for a few seconds, the thistle funnel is filled with distilled water, recently boiled but cold; this will prove at once whether the whole of the air has been expelled, since in that case bubbles will no longer pass through the water in the funnel. The lamp having been removed, the stopcock on the thistle funnel is closed as rapidly as possible, and then the small amount of water which remains in it allowed to pass into the decomposition tube by cautiously opening the stopcock. By this means the air has been entirely driven out from the apparatus, which is ready for the decomposition of the carbonate in a vacuum. The delivery tube has, of course, been coupled up to the gas apparatus previously, and the stopcock in that being opened, the mercury in the measuring tube is allowed to fall, and so a vacuum prepared in the measuring tube for the reception of the gas as fast as it is liberated.

I prefer to decompose the carbonates with hot dilute nitric or hydrochloric acid; this acid should have been boiled for half-an-hour or more, to expel all traces of dissolved gases, and must then be allowed to pass in cautiously in small quantities at a time from the thistle funnel into the tube. The gas, as fast as it is evolved, will pass over into the measuring tube, and in from  $1\frac{1}{4}$  to 2 minutes decomposition will be completed.

The decomposition tube is then filled to within one inch of the top with hot freshly boiled distilled water, and the contents of the tube boiled in the partial vacuum which still exists. By this means the last traces of gas are driven out and collect above the surface of the liquor. This remaining space is then filled up by allowing boiling distilled water to pass in through the thistle funnel until the tube is absolutely full to the stopcock. Thus the apparatus was, when the analysis was started, devoid of air, and full only of watery vapour; and, when the analysis is complete, it contains only water and the solution of the substance also free from air.

Some little difficulty will be experienced at first in avoiding the adding of the acid too rapidly, as the carbonic acid is liberated somewhat violently in the vacuum, but beyond this there will be no practical difficulty in working the process.

As an illustration of the accuracy which may be attained with reasonable care, I may mention that 11 consecutive analyses of calc spar gave a minimum result of 48.96 per cent. and a maximum of 48.99 per cent., and that the 11 determinations were completed within  $2\frac{1}{4}$  hours.

In the case of white lead and carbonate of baryta, the determinations generally agree within .08 per cent.

I need not say anything as to the measuring of the gas, since, of course, the ordinary corrections for temperature, barometric pressure, and watery vapour, must be made in every case.

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#### FLEUSS'S SYSTEM OF DIVING AT THE ROYAL POLYTECHNIC.

THE note by Mr. Howell, the secretary to the Royal Polytechnic Institution, on the new system of diving introduced by Mr. Fleuss, has led the writer of this annotation to make a second series of observations on the process, and we are much indebted to the directors of the Institution, as well as to Mr. Fleuss himself, for the facilities they have afforded us. At our request Mr. Fleuss on Saturday last remained under the water precisely one hour, and would have remained longer on his own account but that the extreme cold of the water rendered his hands, which were not covered, incapable of ready movement. He had been a few minutes in his apparatus, and shut off from the outer air, before he made his descent. We took his pulse before he entered the water, at 6.40 P.M., found it steady and good, at 68 per minute, and his temperature natural. He descended to the bottom of the twelve-foot tank, and remained there until 7.40 P.M., when he signalled by the cord that he was about to ascend. During the time he was immersed he moved about as he liked, picked up coins, and we could see that occasionally he was sitting or partially recumbent. After he came out of the water five minutes elapsed before the helmet and ori-nasal tube could be removed, so that he was actually shut off from the external air one hour and ten minutes at least. Immediately on coming out of the water his pulse was beating at 120 per minute, but this he himself attributed, and we have no doubt correctly, to the fact that he was laden with a weight of 116 pounds (twenty in the boots and ninety-six on the shoulders) in order to keep down under the water, and that it is no easy task to carry that weight up the ladder from the tank. So soon as the helmet and dress were removed we took the pulse again, and found it beating at 90 per minute, the temperature in the mouth being down to 94° Fahr. The breathing was easy, and the face only a little pale. He said he was perfectly comfortable, but felt cold. At the end of 27 minutes after Mr. Fleuss had been out of the water his pulse was at 80 per minute, and his mouth temperature at 96° Fahr. Twenty minutes later still the pulse had come down to 68, and the temperature of the mouth had risen to 97° F. The temperature of the water in the tank was 49° at the surface, and of the surrounding air 51° F. Mr. Fleuss is an Englishman, short, slight, but well built, and full of courage and enthusiasm. He has been an officer in the Peninsular and Oriental Company's service, and has been one year making preparations for this remarkable experiment. His apparatus, which is of rough construction, was made with his own hands, and though for the present he is silent as to its mode of action, he says that nothing about it is more curious than its simplicity. It is quite certain that he has contrived to carry down with him in his diver's dress a sufficient supply of air-food for perfect breathing during very long periods of time, and it is equally clear that he has some means of retaining the expired air, for during the whole time he was in the water not a bubble of air escaped from him that we could detect. Not to be too curious, the experiment promises to be in all points of view, physiological as well as practical, of great and lasting value.—*Lancet*.

## LAW REPORTS.

## NORFOLK BAKING POWDER.

At the Cambridge Petty Sessions, George Warren and Henry Warren, grocers, appeared on remand to a summons obtained by the Market Committee, charged with selling the Norfolk baking powder which was, as an article of food, injurious to health. The actual defendants in the case were Messrs. Smith and Co., of Norwich, the manufacturers of the powder, who had given an undertaking to the Cambridge tradesmen to hold them harmless.

Mr. Cockerell (instructed by the Town Clerk) appeared on behalf of the market committee; Mr. Blofeld appeared for the defendants.

Mr. Cockerell, having opened the case, called the following witnesses:—

Henry Phillips deposed: I am the inspector of provisions under the Corporation. On the 21st of October I purchased four packets of Smith's baking powder. I asked for Norwich baking powder. They were each wrapped up in the paper produced. I told them it was for analysis, and I left one with them, gave one to Mr. Knights, the analyst, and kept one myself. I emptied the four into one, and divided it into three.

By Mr. Blofeld: I act under the instructions of the Town Clerk. I have not heard who has instigated the proceedings.

The Town Clerk deposed that he gave the instructions to Phillips, by direction of the market committee not—

By Mr. Blofeld: I believe I am the sole originator of the proceedings. Mr. Borwick has had nothing to do with it.

James West Knights: I am a Fellow of the Chemical Society, and am Public Analyst for the borough of Cambridge, with other authorities. On the 21st of October, I received from Phillips a parcel of baking powder for analysis. The result of my analysis was that it contained:—Ground rice, 41.5; burnt or dried alum, 15.76; bicarbonate of soda, with traces of potash silica and moisture, 42.74. Burnt alum is merely crystallised alum dried; all the water is evaporated from it. A teaspoonful of this baking powder weighs, on an average, 150 grains. If a teaspoonful were mixed with 1lb. of flour, according to the direction, it would contain about 23 grains of burnt alum, equal to about 44 grains of ordinary crystallised alum. A 4lb. loaf, so mixed, would contain about 118 grains of ordinary crystallised. The ordinary effect of alum is to whiten the bread and give it a good appearance, and makes it light. It forms phosphate, from phosphate of alumina. That is, this proportion would. Phosphate of alumina is insoluble, and destroys all the beneficial effects of bread made from flour. It makes it indigestible. Alum is a strong astringent, and is very much used in dyeing as a mordant. If phosphates are removed from food, it becomes no longer nutritive. It hardens the gluten of the bread, and renders it indigestible and liable to produce injurious results. There would be from 10 to 12 grains of phosphoric acid in a pound of pure flour. It is combined with alkalis. Mixing the spoonful of baking powder in a pound of flour would neutralise about seven grains of phosphoric acid. This is the result of a test. It would destroy it all except a mere trace. No hydrate of alumina exists as such in the powder. There would be a small quantity in the bread, but the main portion would be phosphate.

By Mr. Blofeld: Burnt alum is easily distinguished from crystallised alum, unless mixed with any substance containing moisture. I cannot pledge myself that I found burnt alum in this baking powder. It is impossible to say.

By Dr. Cartmell: I cannot say why I put burnt alum. It might be crystallised, but there would be twice the quantity.

By Professor Liveing: I did not make any determination as to which it was.

By Mr. Blofeld: I told Mr. Adams on the previous occasion that I thought it would weigh a less quantity. I have now tried it. I never saw a chemist use a teaspoonful.

By Mr. Deighton: There is no medical teaspoon that I know.

By Mr. Blofeld: Insoluble phosphate of alumina can be discovered in bread. It hardens the gluten. It acts in its insoluble state. It is mixed up dry. The baking powder is used in baking bread to make the dough rise, by the generation of carbonic acid. This is frequently done by joining acid with carbonate of soda. Muriatic acid is injurious to health. Hydrate of alumina is injurious. It would harden gluten. It is a necessary constituent of clay. It is generally found in bread. If corn is cleaned from clay it will contain none. It is not a constituent of the wheat. It is injurious to health. I should be very sorry to take five grains of it daily. I should be surprised to find that from 60 to 100 grains were given in 24 hours to children. I have seen some accounts of experiments in America. I don't agree

with Professor Patrick in his conclusions. Alum in bread would be injurious if used in any quantities. I adhere to the opinion that the baking powder contains matter injurious to health. I still adhere to my opinion. Dr. Tidy is not the most eminent analyst. I have only used it for experiment.

By Professor Liveing: There was nothing in the powder that would destroy the injurious effect of the alum.

By Mr. Cockerell: Cream of tartar will serve the same purposes as alum, be harmless, but is more expensive. Hydrate of alumina may be good for medicine but injurious as diet.

Matthew Moncrieff Pattison Muir, Praelector of Chemistry at Caius College, deposed: I have made an analysis of the Norfolk baking powder, and agree generally with the results arrived at by the last witness. I have made several experiments with their powder. If water be added to the powder the alum is decomposed, and in baking bread or buns there is no alum. It produces hydrate of alumina, carbonic acid gas, sulphate of soda and ammonia, or potash. I tried an experiment on twelve grains of soluble alkaline phosphate, which would be present in one pound of flour. The result was almost the whole of the alumina was converted into insoluble phosphate of alumina, and thus a mere trace of hydrate of alumina was produced. I made a third experiment, mixing phosphate of soda with hydrate of alumina with water, and warmed, and a considerable amount of phosphate of alumina was produced. I made another experiment. I treated half a pound of flour free from alum with water, and found the water contained large quantities of phosphoric acid. I then mixed half a pound of the same flour with half a teaspoonful of baking powder, and treated it with water in the same way as before. The water now contained very small quantities of phosphoric acid, in the form of soluble phosphate. The insoluble portion was almost certain phosphate of alumina. I believe from these experiments that the baking powder would decompose the greater part of the soluble phosphate in the flour, converting it into insoluble phosphate of alumina, and probably very small quantities of hydrate of alumina.

By Mr. Deighton: My figures agreed with Mr. Knights as nearly as might be; there was not more than one per cent. difference between us.

By Mr. Blofeld: I have not made bread or buns or dumplings with this baking powder. I don't agree with Dr. Tidy's report. From want of medical knowledge, I won't give an opinion as to whether it would be injurious to health. I should say that a large quantity of the powder would destroy the colour of the bread.

Dr. Bushell Anningson, Medical Officer of Health for Cambridge, deposed: I have heard the evidence of the last two witnesses, and in my judgment the effect of making bread with the Norfolk baking powder in the proportion of one teaspoonful in a pound of flour would be to deprive this organism of that nutritive agent which it requires, viz., soluble phosphates. It is stated on authority that the human system requires 50 grains of phosphoric acid per day. That is expected to be derived from bread. The phosphoric acid aids digestion, and is absorbed. The effect of what Mr. Muir has described is to deprive the bread of an essential article of diet. Phosphoric acid is essential to life. Insoluble phosphate would produce indigestion.

By Mr. Blofeld: I have no knowledge that baking powders containing alum have been sold for 30 years. My evidence is founded upon the chemical evidence I have heard. I have known atrophy in hospitals, through the bread used, from baking powder. I should say that bread made by baking powder is indigestible.

By Dr. Cartmell: From the chemical evidence I have heard, I think this baking powder is injurious to health.

Dr. John Buckley Bradbury deposed: I have had ten years' experience as physician of Addenbrooke's Hospital. I have heard the evidence of the previous witnesses. In my judgment the effect of making bread with the baking powder produced would be to rob the system of soluble phosphates, which are essential for nutrition. There is scarcely a third of the body when in good health that does not contain soluble phosphates. Phosphate of soda is found in the blood, and the alkalinity of the blood depends on it, and is necessary for the solubility of albumen in the blood. Anything which interferes with the circulation and respiration, probably it would lead to certain diseases of nutrition, such as consumption. Phosphorus is found in the nervous system, and the only origin of it is these phosphates. The effect of insoluble phosphates on gluten would be to harden it and render it indigestible. I should say the constant taking of food made from baking powder would be detrimental to health.

By Mr. Blofeld: I know from experience that bread made of it gave indigestion.

By Prof. Liveing: I do not think that the introduction of bicarbonate of soda neutralizes the effect of soda.

By the Mayor: After what I have heard I still think that bread made with this powder would be injurious to health.

This was the case for the prosecution.

Mr. Blofeld then addressed the court for the defendants, and contended, in the first place, that baking powder was not an article of food, and if it were it was not injurious to health.

He called the following evidence :—

Mr. Francis Sutton, Analytical Chemist and Public Analyst for Norfolk, Great Yarmouth, Lowestoft, and Thetford, deposed : I am the author of works on analytical subjects which circulate out of England, I have analysed the powder, and agree substantially with Mr. Knight's analysis, but not as to its being burnt alum. To mix the powder in the bread would be to mix it with the dry flour, and then to moisten it to the necessary consistency, to convert it into dough, with water. The moisture liberates carbonic acid gas from the mixture of bicarbonate of soda and alum; that gas causes the bread to rise, and the result in my opinion is that sulphate of soda, sulphate of potash, and hydrate of alumina are found. I have had a 2lb. loaf of bread made with this baking powder strictly in accordance with the directions, and I have then examined it for the quantity of alumina present, and I found it to be three grains and three-quarters of dry alumina. I have also had a loaf of bread of the same size made with yeast, from the same flour, and the quantity of dry alumina I found there was nearly three-quarters of a grain. That is contained in the flour. All the samples of flour I have ever examined did contain alumina, and I have examined many. Alumina is a white powder, which I produced, which is six grains of dry alumina hydrate. It is an earthy matter, and is in all clays a mixture of alumina and oxygen. In my opinion it is not injurious to health. Dr. Pereira recommends it in large quantities for acidity of the stomach. My experience would support Professor Patrick's experiments, that it has no effect whatever on the human system. I have had practical experience of its use for Norfolk dumplings in my own family for some years without the slightest prejudicial effect. It makes light bread. I do not agree that it hardens the gluten and makes it indigestible; I speak from personal experience. Before this case was stirred at Cambridge I never heard any complaint of it. Mr. Muir's experiment was a laboratory experiment. Mr. Muir first separates the soluble phosphates from the flour by water, and then adds either alum or hydrate of alumina or baking powder to them, and so he gets phosphate of alumina. That I should expect he would, but it does not prove that the addition of the baking powder to dough was the same thing, and I do not believe it does become phosphate of alumina in the case of bread. The phosphate would be perfectly inert and harmless to health. It makes no difference whether it is phosphate of alumina hydrate. Excess of baking powder would discolour the bread. My opinion is that bicarbonate of soda neutralises muriatic acid and sulphuric acid. Tartaric acid is sometimes used, but not with such good effect as alum.

By Mr. Cockerell : Alum is cheaper. I have made laboratory experiments. This baking powder does not harden the gluten.

Dr. Michael Beverley, of Norwich, Assistant Surgeon to the Norfolk and Norwich Hospital, and House surgeon for seven years : Taking the evidence I have heard, I am of opinion that there is nothing in the baking powder, used as directed, injurious for food. I have used this bread myself, and have heard no complaint of it before this Cambridge matter arose. Alumina is contained in fuller's earth. Bicarbonate of soda renders alum perfectly inert. I took 20 grains of alumina to see if it had any effect, and it had none whatever, and I am prepared to take the same quantity again.

By Mr. Cockerell : I have not taken that quantity day by day. I believe phosphate of alumina is more injurious than hydrate. I agree that alum is a bad thing in bread.

Mr. Joseph Becarle Smith said : I am the senior partner of the firm who manufacture this baking powder. I was recently Mayor of Norwich, and am now deputy-mayor. I am a wholesale druggist. The manufacture of this baking powder has been carried on for over twenty years. I have carried it on for the last seven years or longer. We send several tons of it from Norwich every week over a great part of the United Kingdom, and a considerable quantity comes to Cambridge. Recently my trade with Cambridge has very much increased. I have never in my life heard anything about this baking powder being injurious before this matter arose at Cambridge.

This concluded the evidence, and the Magistrates retired to consider their decision. After having well considered the case, they returned into court and inflicted a penalty of 40s. and costs. Notice of appeal was given.

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**HEAVY FINES FOR ADULTERATED MILK.**—At the Bristol Council House, Charles Payne, of Downend, was summoned by Mark Hookings, of Berkeley Place, and also by James Baker, of Wilson Place, for selling to them forty quarts of milk, which was not milk but a mixed fluid not of the quality demanded. Mr. Wansbrough prosecuted, and explained that the complainants were dairymen in Clifton, who had

entered into an engagement with the defendant to supply them with milk. The milk had been analysed by Mr. Stoddart, and certified by him to be "deficient in all component parts to the extent of 15 per cent. of the usual average." The article to be supplied to the complainants was "genuine new milk" at 10d. and 11d. per gallon. The complainants were called, and Mr. Yeates, Inspector under the Act, gave evidence, stating that some of Mr. Baker's milk contained 30 per cent. of water. The defendant denied having added water to the milk, and said that he could not be responsible for everything that was done on the farm. The wet weather had much to do with the poorness of the milk. The Bench considered the case a bad one and fined Payne altogether £20 and costs, or in default of payment two months' imprisonment.

**COSTLY ADULTERATION.**—At the Nisi Prius Court the case of *Hayes v. Payne* was heard. Mr. Cole, in stating the plaintiff's case, said, though simple in its facts and nature, it was a very serious matter indeed to the plaintiff, Mr. Hayes, who was a dairyman and milk retailer, 7, Victoria Street, Clifton. He had carried on business there for forty years, and that he carried on a very extensive trade would be gathered from the fact that he paid upwards of £1,000 a year for milk, and he also sold butter and other goods in which dairymen dealt. The defendant was a farmer, and carried on business at Downend, and the consequences of the breach of contract which plaintiff charged defendant with had been very serious indeed, because the Inspector of the Sanitary Authority stopped one of the plaintiff's milk boys in the street, took a sample of milk, which he submitted to the County Analyst, and it was found to contain nearly one-fourth of water. The result was that the plaintiff was summoned before the magistrates and fined £1 and costs. The mere fine was, of course, not a matter of much significance to the plaintiff, but the case was published in every newspaper in Bristol, and was, of course, read by those who were in the habit of dealing with the plaintiff, the result being a most serious injury to his business, and the loss of a great number of his best customers. On the 24th of March, 1878, the plaintiff entered into a contract with the defendant to supply him with milk of the best quality, at 11d. per gallon, up to the 29th of September, and after that date he was to pay a shilling per gallon. Prior to the 27th of September several complaints were made to plaintiff of the quality of the milk, and he complained to the defendant. Mr. Payne replied that it was no fault of his if it was not pure, and in order to secure its not being tampered with, the defendant supplied a padlock to the canister in which the milk was brought into the city, keeping a key himself and sending a duplicate key to the plaintiff. On the 27th of September the milk was received as usual, and put into the cans for the plaintiff's boys to carry out, and it was in no way meddled with. On that day, as a boy was delivering milk, he was met by Mr. Yeates, the Inspector, who bought half a pint of milk, telling him that he purchased it for the purpose of analysis. When the boy got home he communicated to the plaintiff what had occurred, but his milk was then all gone, and it was impossible for him to take a sample of the milk. On the 29th of the same month the plaintiff thought it right to ascertain whether the milk was being supplied in a proper state or not, and though at that time he had not been summoned, he took samples of the milk which came from defendant. In the presence of his man who brought it he unlocked the canister and poured the milk into the cans, and from them he filled three bottles, giving one to defendant's man to take back to defendant, another he took to Mr. Stoddart, the City Analyst, and the third bottle he kept. On the 15th November and the 4th of December he took two further samples, and in consequence of its quality on the latter date he declined to take any more from defendant. The result of the analysis of the milk which the plaintiff sent to Mr. Stoddart was that it contained 25 per cent. more water than there ought to have been. Evidence was adduced in support of this statement, when Mr. Bompas addressed the jury for the defendant, and remarked that though the actual money at stake was small, the action was one of considerable importance to the parties concerned. After the evidence which had been given by Mr. Stoddart, he should not contend that the milk which he analysed was pure milk, for it was evident from the result of his examination that the milk which he submitted to analysis was not pure, genuine milk, which the defendant contracted to serve to the plaintiff, and which he would prove was supplied. The defendant was a man keeping a very large dairy, having from 60 to 100 cows, some of them of the Guernsey and Jersey breed, and some of them half-bred, the milk obtained from them differing in richness and in the proportion of cream, but altogether giving fair average milk. The learned counsel detailed the process carried on in the defendant's dairy, pointing out that the milk obtained from all the cows was mixed and fairly distributed amongst the whole of his customers. He supplied several large institutions, and he should call witnesses from those places to prove that the milk supplied them by the defendant at the time at which the plaintiff complained was perfectly good and pure. The learned counsel contended that it was not for him to show where the adulteration took place, his only object was to prove to them that it had not been the act of the defendant. He thought that it was not an uncommon thing for

milk to be adulterated with water, and that it was no slander to say that milkmen eked out their quantity in that manner. He remembered upon one occasion requesting his milkman to supply the milk and the water separately, and he said it could not be done. After hearing evidence in support of the defence, the Lord Chief Justice fined the defendant £10 and costs, the latter were informed exceeding £300.

**PROSECUTIONS BY THE DAIRYMEN'S SOCIETY.**—At Clerkenwell Police Court, J. Watson, of the Farmers' Dairy Company, Holloway, was summoned for selling a pint of milk to Mr. Parish, Inspector of the Metropolitan Dairymen's Society, adulterated with 18 per cent. of added water. Mr. Ricketts, who appeared on behalf of the Society, said the defendant was in a large way of business, and called Mr. Parish, who said that he purchased a pint of milk of W. Blackwell, servant to the Dairy Company, which was divided in the street into three parts, one being handed to the vendor for his master, and one to Dr. Tidy, the analyst, whose certificate stated that it was adulterated to the extent of 18 per cent. The defendant's counsel said that his client took every precaution to ensure the purity of the milk, but he had so many different suppliers, and thirty men in his employment as carriers. W. Blackwell, who sold the milk, said that the sample which was given to him by the Inspector was accidentally broken, and he did not let his employers know that a sample had been taken. It was urged for the defence that in consequence the defendant was quite ignorant of the matter till he received the summons. The Magistrate said he considered it a very bad case; the defendant being in a large way of business he should fine him £10 and 2s. costs. Mr. Ricketts asked the Magistrate to allow the Society its costs, as it did not get the fine, whereupon his Worship altered his decision, and fined the defendant £5, and £3 5s. costs. At Lambeth Police Court, A. Herring, dairyman, Newington Butts, appeared to a summons taken out by Mr. Parish, for selling adulterated milk. Mr. Ricketts appeared to prosecute on behalf of the Society, and in opening the case stated that the Society prosecuted on public grounds. They were no respecters of persons, and any milk-seller who was suspected of adulteration would be visited by their inspector. This was a very bad case, and he intended asking for a full penalty. Mr. Parish proved purchasing a pint of milk at the defendant's shop. He was served by a young woman in the service of defendant, and told her after the purchase that it was intended to have the milk analysed. She then told him that it was not pure milk. In answer to the complaint, the defendant said on the day in question he could not get the quantity of milk he required, and therefore had to add some water. Mr. Saunders said the defendant then admitted adding water to the extent of some 25 per cent., for that was the adulteration according to the certificate produced before him. It was a most shameful case, and he ordered the defendant to pay a fine of £5, and £1 3s. costs.

**ADULTERATION OF FLOUR.**—Colonel Shortt, the Inspector for North Derbyshire, under the Sale of Food Act, summoned Edmund Hodgkinson, of Baslow, miller, for selling a packet of flour adulterated with alum to the extent of 150 grains to 4 lbs. of flour. Mr. Hughes, of the firm of Young and Co., of Sheffield, appeared for the defendant. The defendant appeared to have allowed the Inspector to choose samples where he liked in the mill, and three were taken and paid for and divided in the usual way for analysis. Two of the samples were pure, but one was said to be adulterated as charged. This sample was marked "Flour-fourths," and it was contended that it was not used for the food of man, and the defendant said that it was taken from an open bag, from which his men fetched it to feed the pigs. He did not know how the alum had got into it. Mr. George Wallwinn, Mr. J. B. Bowman, and Mr. John Evans, millers in the neighbourhood, were called for the defence, and each of them stated that flour-fourths or "fine sharps" were not used for the food of man, neither was it the practice to mix alum with it, as it would spoil the flour. Case dismissed.

**COUNTRY MILK.**—At Clerkenwell Police Court, on the 23rd ult., Isaac Price, of 7, Great Sutton Street, Clerkenwell, was summoned by Sanitary Inspector Cheshire, Clerkenwell, for selling milk adulterated to the extent of 20 per cent. with added water. Mr. Bolton, solicitor for the parish, said he did not ask for a large penalty. Mr. Ricketts, for the defence, urged that the defendant was a poor man, and "sold the milk as country milk." He had no idea of cheating his customers. The Magistrate ordered the defendant to pay a fine of 10s. and 2s. costs.

**REFUSING TO SERVE AN INSPECTOR.** At Southampton, on the 21st ult., a milk vendor named Silas Rawlins, living at Millbrook, who has several times been heavily fined for selling adulterated milk, was fined £10 and costs, by the borough magistrates, for refusing to supply milk to the Inspector for the purposes of analysis, under section 4 of the Amended Food and Drugs Act. The proceedings were instituted by the Corporation, who have obtained a large number of convictions on similar informations within the past fortnight.



**ANOTHER REFUSAL TO SERVE.**—At Lambeth, Mr. Marsden, the vestry clerk of St. Giles's, Camberwell, appeared in support of several summonses taken out, under the New Adulteration Act, in reference to the supply of milk. Some important questions were raised in the investigation. The Sanitary Inspector was refused by the servant of one of the defendants who was serving milk at houses, and, on being asked for a quantity by the officer, declared that he had none to spare, and that all he had was required for the customers. Mr. Marsden said if such an excuse were allowed the new Act would be defeated. Mr. Chance thought it must be shown that a man had milk to sell, and those customers who had ordered certain quantities were not to go without their breakfast because an inspector wanted a certain quantity for the purpose of analysis. Mr. Marsden thought that the men should be supplied with a quantity beyond the quantity ordered. The new provision was framed at the instance of the Local Government Board to meet the defect in the former Act as to milk sold in the streets. If the view taken by the magistrate prevailed, the new Act could be easily defeated, and the best way would be to take a special case to the superior Court. Mr. Chance asked why the milk could not be obtained at the shops. Mr. Marsden said because shops now supplied good milk, and milk-and-water was sent out to the customers, and if the excuse "None to spare" were allowed the new statute would be entirely defeated. Mr. Chance said it was certainly a most important question, but he did not see how, when a certain quantity was ordered, a man was bound to supply an inspector. The case was worthy of consideration, and a special case for the superior Court might be granted.

**SELLING IMPOVERISHED MILK.**—Sarah France, Oldfield Square, Lockwood, was charged with selling milk not of the nature or quality demanded. Mr. Kirk, the sanitary inspector, said the defendant was a milk dealer, and that on the 15th October he saw her son delivering milk, and went and asked him whether he would let him have a pint. He replied "Yes." When he had got the milk he told him who he was, and that the milk was intended for analysis, and asked him if he would retain a portion. He said he would, and he (Mr. Kirk) divided it into three portions—one he retained, one he gave to defendant's son, and the other he submitted to Mr. Jarman, the Public Analyst. When defendant's son supplied him, he (Mr. Kirk) said, "I suppose you sell this as new milk?" He replied, "Yes; just as we get it from Thomas Shepherd, of Holmfirth." Mr. Jarman's certificate was put in, and showed that the milk had been deprived of 25 per cent. of butter fat. He (Mr. Kirk) had since got a sample of milk from the wholesale dealer (Mr. Shepherd) and found it corresponded in quality to that obtained from the defendant, but Mr. Shepherd told him that the milk supplied to defendant was not new, but skimmed. Thomas Shepherd, farmer and milk dealer, Bottoms, Holmfirth, said he was in the habit of supplying the defendant with milk. He supplied her on the 15th Oct. with the usual quality—"night's" and "morning's," which meant the night's milk skimmed, mixed with the morning's new milk. Mr. Kirk: Is the defendant aware of that fact? Witness: For anything I know. Mr. Jarman was called, and the Bench asked him whether mixing skimmed with new milk would make 25 per cent. difference? Mr. Jarman said that milk varied very much in the amount of butter fat it contained. The Public Analysts had fixed a certain standard limit, and when milk is below this they think it has been tampered with. They took a very lenient view and allowed a liberal margin, but a deficiency of 25 per cent. of butter fat was much below the limit. Mixing night's skimmed milk with morning's new would make at least 25 per cent. difference in the quality. The Bench considered the charge proved and imposed a penalty of 20s. and costs, altogether £2 5s. 6d. William Fearnley, milk dealer and farmer, Honley, appeared to answer two charges of a like nature, and he pleaded guilty to both. Mr. Kirk said the defendant was in the habit of delivering milk from house to house. Whilst so engaged at Taylor Hill on the 15th October, he sent a person to purchase some, and he was refused. He then went himself to defendant and said, "Won't you let me have any then?" He replied, "Oh, it's you, is it? Yes, I'll let you have some, but it's old." He asked the defendant what he had been selling in the house. He replied, "Old of course." He (Mr. Kirk) obtained a pint of milk and paid defendant a penny for it, told him it was for analysis and gave him a third part of it. Mr. Jarman's certificate of analysis showed it to be deficient of 45 per cent. of butter fat. Mr. Kirk said that although the defendant sold the milk to him as old, there was no doubt he did so to escape the consequences, and that he had been selling it as new milk to his customers. Mr. Jarman said old milk showed 1 per cent. of cream, but the sample in question showed 4 per cent. of cream and 6 per cent. butter fat, whereas old milk never contained more than 1 per cent. The sample submitted was, in his opinion, a mixture of night's and morning's milk. New milk showed 8 per cent. of cream. Mr. Kirk said that five minutes after taking the above sample he proceeded to a house, and a person consented to get another sample from the defendant. When he came round this person bought a pint of milk, for which defendant charged 2d. He (Mr. Kirk) stepped forward and paid for it, and told him again it was for analysis, and said, "What kind of milk do you

call this?" Defendant said, "Oh, this is different; this is a mixture of night's and morning's." He (Mr. Kirk) then said, "How is it that you said before you had nothing but one sort?" Defendant seemed quite "flabbergasted," and could not answer. Mr. Jarman's certificate showed that the milk had been impoverished by the removal of 28 per cent. of butter fat. Defendant said he had told his customers time after time what it was, that it was not new milk. He got it from the farmers, and sold it just as he got it, and Mr. Kirk ought to prosecute the farmers, not him. Mr. Kirk said defendant's object had been to evade the Act, and he asked the Bench to impose a heavy penalty. The Bench said they considered it a very bad case indeed, and imposed a penalty of £5 and costs in each case, altogether £13 13s., or in default, three months' imprisonment in each case. The defendant, who seemed struck dumb, said, after a long pause, "I think it's too much."

**SPURIOUS TEA.**—"At the tea sales this week some re-dried teas, which had been submerged in the Thames, found buyers at 3½d. to 10d. per lb. for the capers, and 11d. to 1s. for the orange pekoes." Selling tea of this sort, besides giving an erroneous idea of the value of genuine teas bearing the above names, is committing a great wrong on consumers, who, caught by the apparent cheapness of the specious article, are deceived into buying what is mere rubbish and unfit for food. We also briefly allude to some other parcels that were offered on Thursday, the 6th inst., as "gunpowder," but no more resembled that choice description than painted flowers, being nought else but coarse sloe-leaves and dust thickly coated with mineral facing. The day of the month inclines us to think that there was more "treason" than "gunpowder," and very little indeed of the latter compound in the teas and those who offered them. The teas were imported as far back as 1872, and sold at 6d. to 9½d. in bond. Will the proper "authorities" interfere and stop this spurious tea from paying duty, and so passing into consumption?—*Grocer*.

**A DEEP ARTESIAN WELL.**—The sinking of the deep artesian well near Buda Pesth is now completed; the works were commenced as far back as 1868, and during their progress many interesting facts relating to geology and underground temperature have been brought to light. The total depth is 3,200 feet, and the temperature of the water it yields is nearly 165° F. The temperature of the mud brought up by the borer was taken every day, and was found to increase rapidly, in spite of the loss of heat during its ascent, down to a depth of 2,300 to 2,700 feet. Beyond this point the increase was not so marked. At a depth of 3,000 feet the temperature was 177° F., giving an average increase of 1° for every 23 feet bored. Water first commenced to well up at a depth of 3,070 feet; here its temperature was 110° F., and from this point onward it rapidly increased both in quantity and temperature. Thus, at 3,092 feet, its temperature had already risen to 150° F., and the yield in twenty-four hours from 9,500 to 44,000 gallons. Finally, when the boring had reached 3,200 feet, at which point it was stopped, the temperature of the water, as it burst from the orifice of the tube, was 165° F., and the volumetric yield 272,000 gallons in the twenty-four hours. This yield was afterwards reduced to 167,200 gallons, in consequence of the bore being lined with wooden tubes, which reduced its diameter. The water obtained disengages carbonic acid in abundance, and also contains nitrogen and a little sulphuretted hydrogen, and 80 grains per gallon of fixed matters, chiefly sulphates and carbonates of potash, soda, lime, and magnesia.—*Brewers' Guardian*.

### NOTES OF THE MONTH.

It is curious that *The Grocer* should enquire "Where are the analysts?" but still more so that it should be because some one has sold rotten beef. However, when we read a little further, we find that it is a co-operative society who is in fault, so there is no wonder. The *Grocer's* antipathy to co-operative societies must certainly be expected to override its natural aversion to analysts.

We are not at all surprised that some of our contemporaries want to know how it is that, since the Somerset House Chemists now agree to the milk standard of the Public Analysts, there should have been any differences in time past. This, however, is easy to explain. Experience is not gained in a day, and the Inland Revenue officials (of course we do not speak of Mr. Bell and his colleagues, but only of the gaugers and

other similar officials employed to collect the samples of milk) have now gained the necessary experience, and find that the figures we laid down years ago are correct. Such an accordance implies no discredit to the Somerset House chemists, but, on the contrary, simply shows that as they obtain new light on the matters in question they act as scientific men should, and alter their opinions accordingly.

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Mr. Chance, the worthy magistrate of Lambeth, in his wisdom, thinks that a milkman delivering milk at houses must be proved to have milk to sell before he can be summoned for refusing to serve an Inspector, and that customers who have ordered certain quantities are not to go without their breakfast merely because an Inspector wants some milk for analysis. We are extremely sorry to find a metropolitan magistrate holding such an absurd opinion as this. Even if milkmen have not always far more than enough to serve their regular customers with, yet surely such customers deserve to be as much protected from fraud as people who obtain milk from shops. But if such a decision as this is to stand, a milk-round, at least in Mr. Chance's district, will be about the most profitable concern going, as the dealers prohibited from watering the milk sold in their shops will take good care to well water that to be delivered at houses, and with the excuse Mr. Chance has put into their mouths, "None to spare," they may go on their round rejoicing, and bid defiance to the Inspector. We presume the Lambeth magistrate actually has seen the Act passed last session to enable Inspectors to purchase samples from street vendors. We are happy to see that other magistrates hold a more sensible view, and consider that if a milkman has a can from which he is serving customers at houses with one, two, or three-pennyworth, according to the quantity required, he is actually selling milk. If some of his customers require more than usual, he don't say to them, "None to spare," because he is prepared for it; and he is equally prepared with enough extra milk to serve an Inspector with a pint. If he refuses he does so because he knows he will be summoned for adding water, and not for the reason Mr. Chance gives.

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We notice that a Bristol farmer has lately been fined £20 and costs for sending out to his customers milk containing 15 per cent. of water; and in another case—an action against him by a dairyman for supplying milk containing 25 per cent. of water—he has been condemned to pay a fine of £10 and the costs, which are said to amount to over £300. We should imagine that this farmer, with a dairy of a hundred cows, will, in future, send out their produce only to his customers, and not indulge in the expensive habit of mixing with it the produce of the cow with an iron tail. With these costly proceedings in the mind of the Bristol farmers, the milk dealers there will, we hope, get the purest milk supply in the kingdom; but we rather wonder whether it will be in the same pure condition when it reaches the consumers.

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Sunday adulteration may fairly be commended to the notice of inspectors. We used to have milk and water on Sunday morning, but as we did not agree to the maxim of "the better the day the better the deed," a vigorous remonstrance and a private milk-can put a stop to the swindle. The inspectors had better look out a little sharper,

perhaps some other things besides milk may be reserved for Sunday morning, or at any rate Saturday night might be possible. We have to thank a trade contemporary for this hint.

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It might be only fair to give the traders a hint in return. If it should happen that a manufacturer receives a letter threatening him with exposure because, as it is alleged, his manufactures contain poisonous metals, his proper and straightforward course is at once to submit samples to the Public Analyst of the district in which his works or warehouse is. The cost of such a course will be, comparatively speaking, trivial; while the cost of black mail can never be foretold.

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Manufacturers should bear in mind that no proceedings can possibly be instituted on the certificate of any person other than a Public Analyst, and that Public Analysts are the only legally appointed officers to whom cases of supposed adulteration can be sent.

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The term Public Analysts is a legal title; but, if some recent proceedings are continued, it will certainly become necessary to impose by law a penalty on those using it illegally. Public Analysts are amenable to the veto of the Local Government Board on their appointments, and it is quite right that they should be so; but for that very reason, those who pretend to act as Public Analysts without authority must be made subject to penalty.

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It would be very interesting if some of the millers would tell us if alum is ordinarily mixed with pig food. Of course Public Analysts have no concern with the matter directly, but when samples of "flour fourths" are said to be intended for the food of pigs, and not men, the question naturally arises, "In what way can the alum do good to the pigs?" We do not recollect that we have ever heard that swine showed any preference for bread artificially whitened.

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The papers for this month contain reports of a number of cases of proved adulteration, in which the summonses have been dismissed merely because the vendors have declared the admixture after the inspector had said that he purchased for analysis. An important case has, however, just been decided on appeal before Justices Lush and Manisty, which we trust will put an end to this. We must postpone until next month a full report of the case; but, shortly, the judges affirmed the conviction of a vendor who had been asked for coffee and received the price of coffee, and supplied instead a mixture of chicory and coffee, although he had, after being informed that the sample was required for analysis, called the purchaser's attention to a label declaring it to be a mixture.

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We have not space to do more than call the attention of our readers to the full report on another page of the decision at Cambridge with respect to Norfolk Baking Powder.

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#### ANALYSTS' REPORTS.

The quarterly report of Mr. W. W. Stoddart, Analyst for the City of Bristol, states that he has examined sixty-four samples of food, &c. Three of the samples were of so bad a quality that adulteration

was suspected. One sample of butter submitted by a private individual was genuine, but of bad quality and with a rancid smell. Five other samples were good. A sample of tea submitted by a private individual was good.

Mr. W. F. Lowe, Analyst for Flintshire, reports that during the last quarter he examined 21 samples of which 7 samples were adulterated, viz.:—5 out of 9 samples of spirits, and 2 out of 6 samples of milk—a large percentage, which shows that Mr. Lowe's recent appointment as analyst was made none too soon. We hope that his next report will show both an increase in the number of samples examined and a decrease in the percentage of adulteration.

Mr. West Knights, Public Analyst for Cambridge, in his report for the quarter ending September 30th, stated that twelve samples of food and drugs had been submitted to him for analysis, four of which he found to be adulterated. Out of four samples of buns three were genuine, and one was adulterated with alum in the proportion of 182 grains of alum per four pounds. The vendor, on being summoned, proved the use of a certain baking powder (which was found to contain 15 per cent. of burnt or dried alum) and was fined 1s. and costs. Out of four samples of baking powder, two, of the same make as the above, were adulterated with 15 per cent. of alum. Three samples of drugs, viz., spirit of nitrous æther, grey powder, and blue pill were found to be genuine. One sample of milk, submitted by a private purchaser, was found to be skimmed milk, diluted with 18 per cent. of water. No proceedings were taken against the vendor.

**ADULTERATED HOPS.**—The *Transactions of the Medical Society of Upsala* contain an account of an ingenious fraud in the hop trade, said to be practised on a considerable scale in that city. Hops which have already been used for making extracts, or for brewing in the ordinary way, are damped with a tincture of absinthe or wormwood, freed from spirit by distillation, re-dried, and then placed in the market as a genuine article with or without much bloom. Owing to their increased bitterness they often command a better price than unadulterated hops.

**ANSWERS TO CORRESPONDENTS.**—T. Woods.—You will find a note "On the Determination of Alcohol in Ether and Chloroform," by Mr. Allen, in *THE ANALYST*, Vol. II., p. 97.

### RECENT CHEMICAL PATENTS.

The following specifications have been published during the past month, and can be obtained from the Great Seal Office, Cursitor Street, Chancery Lane, London.

1879. No.	Name of Patentee.	Title of Patent.	Price
967	R. Weare .. .. .	Manufacture of Charcoals .. .. .	2d.
1012	A. L. Coke .. .. .	Electric Lighting .. .. .	2d.
1266	J. H. Johnson .. .. .	Manufacture of Saccharate of Lime.. .. .	4d.
1306	J. Allmann .. .. .	Separating Sulphur from Alkaline Solutions .. .. .	2d.
1313	S. G. Thomas .. .. .	Manufacture of Bessemer Steel from Phosphoretic Pig Iron .. .. .	4d.
1359	H. E. Newton .. .. .	Manufacture of Sulpho Cyanides and Ferro Cyanides .. .. .	6d.
1387	A. W. Lake .. .. .	Dynamo and Magueto Electric Machines .. .. .	4d.
1410	H. J. Haddan .. .. .	Purifying Gas .. .. .	4d.
1444	W. L. Wise .. .. .	Producing Preparations of Alumina .. .. .	4d.
1484	M. Gill .. .. .	Evaporating Saccharine and other Liquids .. .. .	6d.
1509	J. H. Johnson .. .. .	Manufacture of Aluminium .. .. .	4d.
1577	F. T. Reade .. .. .	Eliminating Phosphorus from Phosphoretic Pig Iron .. .. .	2d.

### BOOKS, &c., RECEIVED.

The Chemist and Druggist; The Brewers' Guardian; The British Medical Journal; The Medical Press; The Pharmaceutical Journal; The Sanitary Record; The Miller; Journal of Applied Science; The Boston Journal of Chemistry; The Provisioner; The American Dairyman; The Practitioner; American New Remedies; Proceedings of the American Chemical Society; Le Praticien; The Inventors' Record; New York Public Health; Philadelphia Printers' Circular; The Scientific American; The American Traveller.